PRACTICE EXAM 12: RED SEAL STEAMFITTER/PIPEFITTER SIMULATION (130 QUESTIONS)

1. A first-aid attendant arrives at a worker who collapsed near a steam header and is unresponsive but breathing normally with a clear airway. While help is summoned, what is the most appropriate immediate action?

A. Begin chest compressions right away in case of cardiac arrest

B. Place the worker in the recovery position and monitor breathing

C. Give the worker water to drink to restore alertness

D. Sit the worker upright against the header until they wake

2. A coworker tells you a particular pipe-joining compound "has never hurt anyone, so the SDS doesn't matter." What is the most defensible response under WHMIS 2015?

A. Agree, because long use proves the product is harmless

B. Use the product but skip reading the label this once

C. Review the safety data sheet before handling the product

D. Refuse to work anywhere near the product permanently

3. You discover a frayed cord on a portable grinder mid-shift. Which action best reflects correct practice?

A. Wrap the frayed section in electrical tape and continue

B. Keep using it carefully until the task is finished

C. Tag the tool out of service and remove it from use

D. Swap only the plug and return the grinder to the rack

4. Two workers must carry a long, heavy length of pipe across an uneven yard. What is the best way to reduce the risk of a musculoskeletal injury?

A. Have the stronger worker carry the heavier end alone

B. Carry it quickly to minimize the time under load

C. Each worker twists to watch their own footing

D. Coordinate the lift, keep loads close, and clear the path

5. During a toolbox talk, a new apprentice asks why a hot-work permit is needed when a fire extinguisher is already present. The best explanation is that the permit:

A. Replaces the need for any fire watch on site

B. Is only a formality with no real safety function

C. Guarantees no fire can start during the work

D. Confirms hazards are controlled and a fire watch is assigned

6. A worker plans to enter a large process tank that previously held a solvent. Air testing reads acceptable, but readings were taken only at the manway. What is the most prudent next step?

A. Enter immediately since the manway reading passed

B. Skip further testing because solvents evaporate quickly

C. Test at multiple depths before any entry is permitted

D. Have one worker enter briefly to confirm it is safe

7. You notice a guardrail section has been removed from a scaffold to pass material through, and the gap is now unattended. The correct action is to:

A. Restore the guardrail or otherwise protect the opening now

B. Leave it open since material will pass through again soon

C. Mark the area with a single strip of caution tape only

D. Report it at the end of shift in the logbook

8. A drawing note reads "FF" beside a flange callout. In piping terminology this most commonly designates a:

A. Flat-face flange

B. Field-fabricated joint

C. Full-flow fitting

D. Forged-fitting weld

9. A pipe spool must fit precisely between two fixed flanges already in place. The most reliable approach to capture the required dimensions is to:

A. Use the nominal drawing dimensions without checking

B. Estimate the gap and cut slightly long for grinding

C. Field-measure the actual face-to-face gap directly

D. Assume both flanges are exactly on their stated grade

10. On an isometric, a dimension is shown with the abbreviation "TOS." This reference is most likely the:

A. Total offset span of the run

B. Top of steel elevation

C. Type of service code

D. Termination of system point

11. A 60° offset must be calculated. The travel equals the set multiplied by which constant?

A. 1.000

B. 1.155

C. 1.414

D. 2.000

12. A 60° offset has a set of 500 mm. The travel is approximately:

A. 500 mm

B. 577 mm

C. 1000 mm

D. 707 mm

13. A rolling offset has a true offset (the hypotenuse of the vertical and horizontal sets) of 400 mm and uses 45° fittings. The travel is approximately:

A. 400 mm

B. 566 mm

C. 283 mm

D. 800 mm

14. When marking a pipe for a saddle (branch) cut by wrapping it, the wrap-around must be applied so that its edge is:

A. At any convenient angle to the pipe

B. Square (perpendicular) to the pipe axis

C. Parallel to the pipe's seam weld only

D. Aligned with the threads at the end

15. A welded butt joint is being prepared on Sch 40 pipe. The land (root face) is the:

A. Flat, unbeveled portion at the bottom of the bevel

B. Total included angle of the groove

C. Gap between the two pipe ends

D. Reinforcement added on the outside of the weld

16. A pipe is dimensioned "DN 50" on a metric drawing. This is equivalent to which NPS?

A. ½ NPS

B. 1 NPS

C. 2 NPS

D. 4 NPS

17. When a threaded joint is assembled, applying excessive sealant and over-tightening a fitting onto a brittle component most likely causes:

A. A perfectly tight, permanent seal every time

B. Faster assembly with no downside

C. Reduced thread engagement and looseness

D. Cracking or splitting of the fitting

18. A pipe support's load must be transferred to the building structure. Selecting an attachment point should be based primarily on the:

A. Structure's ability to carry the imposed load

B. Colour of the structural steel

C. Closest convenient location only

D. Preference of the installer

19. A line on a P&ID is shown as a double slash through the pipe symbol. This most commonly indicates a:

A. Buried section of pipe

B. Pipe break or interruption in the drawing

C. Section requiring insulation

D. Welded versus threaded transition

20. A spool drawing calls for a "WN" flange. This abbreviation refers to a:

A. Wall-nut threaded flange

B. Weld-neck flange

C. Wide-nominal flange

D. Welded-nipple connection

21. When two welders fit up a large-diameter butt joint, tack welds are placed primarily to:

A. Replace the need for a full root pass

B. Increase the root gap during welding

C. Hold alignment and spacing during welding

D. Serve as the final reinforcement of the joint

22. A pipe must rise 1.2 m over a horizontal run of 1.2 m using a single offset. The required fitting angle is:

A. 45°

B. 30°

C. 60°

D. 22.5°

23. A grooved-end mechanical coupling joins two pipe ends by:

A. Engaging a gasket and housing seated in rolled grooves

B. Welding the coupling permanently to both ends

C. Threading directly onto tapered pipe ends

D. Flaring the pipe ends into a compression seat

24. A reducing tee is marked "150 × 150 × 100." The "100" refers to the:

A. Pressure class of the run

B. Length of the tee in millimetres

C. Schedule of the branch

D. Branch (outlet) nominal size

25. When laying out anchor bolt locations from a drawing, the most accurate datum to measure from is the:

A. Nearest random column flange

B. Established reference line or benchmark

C. Edge of the freshest concrete pour

D. Centre of the nearest doorway

26. A piece of pipe is to be threaded, but the die produces threads that are too shallow and the joint leaks. The most likely cause is:

A. Too much cutting oil applied to the dies

B. The pipe was reamed before threading

C. Worn or improperly set dies

D. The pipe was cut too square

27. When fabricating a long pipe run with several welded joints, weld locations should be planned to:

A. Fall exactly on every pipe support

B. Cluster as many welds together as possible

C. Be hidden inside wall penetrations

D. Avoid supports and allow access for inspection

28. A rigger must select a sling for a 3000 kg load lifted with a two-leg bridle at 45° from horizontal. Compared with a vertical pick, each leg's tension is:

A. Exactly 1500 kg with no increase

B. Less than 1500 kg

C. Greater than 1500 kg due to the angle

D. Zero because the legs share evenly

29. During a tandem lift with two cranes, the most important coordination requirement is:

A. Each operator works to their own judgment

B. Only the heavier crane follows signals

C. Speed, to complete the lift quickly

D. A single lift director controlling both cranes

30. A wire-rope sling has been kinked permanently in the body of the rope. The correct disposition is to:

A. Straighten the kink and return it to service

B. Lubricate the kink and derate the sling

C. Use it only for vertical pulls under WLL

D. Remove the sling from service

31. Before a lift, the rigger finds the load's centre of gravity is not centred between the chosen pick points. The most likely result if the lift proceeds unchanged is that the load will:

A. Tilt toward the heavier side when raised

B. Lift perfectly level regardless

C. Rotate exactly 90° and stabilize

D. Reduce the tension in both slings equally

32. A synthetic web sling shows melted or glazed fibres on its surface. This indicates:

A. Heat or chemical damage requiring removal from service

B. Normal wear that can be ignored

C. The sling is now stronger from heat treatment

D. A need only to wash the sling before reuse

33. When a load must be turned over (flipped) during rigging, the safest general method is to:

A. Push it by hand once it is airborne

B. Use a single sling and let it swing freely

C. Strike it with a bar to start the rotation

D. Use a planned tip/turn procedure with controlled rigging

34. A shackle is rated by its working load limit stamped on the bow. Using a shackle with the pin loaded sideways:

A. Increases its rated capacity

B. Reduces its effective capacity

C. Has no effect on the rating

D. Doubles the safe working load

35. A spreader bar and a lifting beam differ chiefly in that a spreader bar is loaded primarily in:

A. Compression along its length

B. Tension along its length

C. Torsion around its axis

D. Bending across its midpoint

36. When hand-signalling a crane, a clenched fist held stationary by the signal person means:

A. Raise the load slowly

B. Swing the boom left

C. Lower the boom

D. Stop

37. A rigging plan calls for slings rated with a 2:1 design factor. If a sling's breaking strength is 10,000 kg, what is its working load limit?

A. 10,000 kg, equal to the full rated breaking strength of the sling

B. 5,000 kg, which is half of the sling's rated breaking strength

C. 2,000 kg, calculated by dividing the breaking strength by five

D. 1,000 kg, calculated by dividing the breaking strength by ten

38. Softeners (corner protectors) are placed under a synthetic sling at a sharp load edge to:

A. Increase the lifting height available

B. Protect the sling from being cut

C. Add weight to balance the load

D. Replace the need for a tag line

39. A crane's load chart capacity decreases as the:

A. Counterweight is added to the rear

B. Boom is lowered to horizontal only

C. Load radius increases from the centre

D. Outriggers are fully extended

40. A high-pressure steam system is generally classified as one operating above a gauge pressure of:

A. 103 kPa (15 psig)

B. 350 kPa (50 psig)

C. 700 kPa (100 psig)

D. 1000 kPa (150 psig)

41. A steam main develops loud banging shortly after start-up each morning. The most likely cause is:

A. Excessive insulation on the main

B. The relief valve set too high

C. Condensate not drained before steam is admitted

D. The boiler firing at too low a rate

42. An inverted-bucket steam trap suddenly loses its prime and blows steam continuously. The most likely reason is:

A. A sudden pressure drop emptied the water seal

B. The bucket became permanently heavier

C. Too much condensate flooded the inlet

D. The thermostatic element overheated

43. A heat exchanger on modulating load is short-cycling and flooding with condensate at low load. The most likely culprit is:

A. An oversized relief valve on the shell

B. Insufficient insulation on the supply

C. Stall caused by inadequate trap capacity or pressure

D. Excessive pitch on the steam supply main

44. A drip leg ahead of a steam control valve should be sized so that it:

A. Restricts steam flow to the valve

B. Vents flash steam to atmosphere

C. Increases velocity through the valve

D. Captures condensate before the valve

45. A pressure-reducing valve hunts (oscillates) continuously on a steam line. A common contributing cause is:

A. The PRV is grossly oversized for the load

B. The downstream piping is too large

C. The strainer ahead of it is brand new

D. The pilot line is too short

46. When warming up a cold high-pressure steam main, the warm-up valve (bypass) is opened first to:

A. Increase the test pressure rapidly

B. Admit steam slowly and drain condensate

C. Bypass the relief valve permanently

D. Vent the main to atmosphere fully

47. A boiler's safety valve is found to be weeping (slightly leaking) just below set pressure. The most appropriate action is to:

A. Increase the boiler operating pressure to seat it

B. Gag the valve closed to stop the leak

C. Repair or replace the valve per the code

D. Ignore it as normal operation

48. A two-pipe steam system has cold radiators at the far end of a long run while near ones heat well. A likely cause is:

A. Excess pitch on the return only

B. The boiler firing rate is too high

C. The far radiators are oversized

D. Air binding or undersized piping at the far end

49. A steam trap's discharge is checked with a test valve and found to blow continuously with no condensate. The trap has most likely:

A. Failed open (passing live steam)

B. Failed closed (backing up condensate)

C. Reached normal equilibrium operation

D. Been correctly sized for the load

50. A flash tank is installed on a high-pressure condensate system to:

A. Increase the condensate pressure further

B. Recover usable low-pressure flash steam

C. Cool the condensate below ambient

D. Filter dirt from the returning condensate

51. A boiler feedwater system uses a deaerator chiefly to:

A. Increase the feedwater pressure only

B. Add chemical inhibitors to the water

C. Remove dissolved oxygen and gases

D. Cool the feedwater before the pump

52. A condensate pump's discharge check valve is installed to:

A. Prevent backflow when the pump stops

B. Throttle the pump's flow continuously

C. Relieve pressure to the atmosphere

D. Vent air from the pump casing

53. A steam trap selected for a unit heater at the end of a long branch should be sized for the:

A. Maximum condensate load with adequate safety factor

B. Minimum possible condensate load only

C. Diameter of the supply main alone

D. Colour code of the steam piping

54. On a high-pressure steam main, a properly installed steam separator improves performance by:

A. Increasing the moisture carried downstream

B. Reducing the steam pressure to zero

C. Adding condensate to the steam flow

D. Removing entrained moisture from the steam

55. A hydronic system's boiler keeps short-cycling on its high-limit control. A likely cause is:

A. The expansion tank is oversized

B. The system has too many air vents

C. Insufficient flow through the boiler

D. The circulating pump is too large for the loop

56. Air is repeatedly collecting at the top of a hydronic riser. The best corrective measure is to install:

A. A balancing valve at the boiler outlet

B. A second circulating pump in series

C. An air vent at the high point

D. A larger expansion tank only

57. A hydronic zone is not heating while others are fine. The first item to check is the:

A. Boiler's main fuel pressure

B. Zone valve or circulator for that zone

C. Outdoor reset sensor wiring

D. Expansion tank charge pressure

58. In a closed hydronic loop, raising the cold-fill pressure too high may cause the:

A. Relief valve to discharge water

B. Pump to lose prime entirely

C. Expansion tank to freeze

D. Boiler to lose its water seal

59. A primary-secondary hydronic system uses closely spaced tees so that the secondary pump:

A. Forces all flow back through the boiler

B. Operates without affecting primary flow

C. Must always run faster than the primary

D. Replaces the need for any balancing

60. A chilled-water coil is sweating heavily and dripping onto equipment below. The most likely deficiency is:

A. The chilled-water temperature is set too high

B. Missing or damaged insulation and vapour barrier

C. The coil is oversized for the load

D. The condensate pump is running too fast

61. When charging a glycol solution into a closed system, the concentration should be verified with a:

A. Pressure gauge on the loop

B. Flow meter at the pump

C. Refractometer or hydrometer

D. Standard thermometer alone

62. A three-way diverting valve in a hydronic system is used to:

A. Send flow to one of two paths

B. Combine two return streams into one

C. Relieve overpressure to atmosphere

D. Remove air from the system high point

63. A condenser-water loop serving a cooling tower must include treatment chiefly to control:

A. Scale, corrosion, and biological growth

B. The chilled-water supply temperature

C. The refrigerant charge in the chiller

D. The building's static pressure

64. A process line carrying a fluid at high temperature shows repeated support failures at one hanger. The most likely cause is:

A. The hanger is painted the wrong colour

B. The pipe is too short for the run

C. Thermal expansion forces not accommodated

D. The fluid velocity is too low

65. A globe valve installed backwards on a line (against the flow arrow) will most likely:

A. Increase the line's flow capacity

B. Seal more tightly under pressure

C. Tend to slam shut or chatter under flow

D. Have no effect on operation

66. A strainer on a pump suction repeatedly clogs soon after each cleaning. The best long-term corrective step is to:

A. Remove the strainer permanently

B. Increase the pump speed to push through debris

C. Run the system without filtration

D. Locate and eliminate the debris source, then flush

67. A pressure-relief valve on a closed hydronic system is sized based on the:

A. Pipe colour and labelling

B. Number of radiators served

C. Pump's electrical rating

D. Boiler's maximum heat input/relieving capacity

68. A balancing valve with a built-in flow-measuring feature is set during commissioning by:

A. Closing it fully and reopening one turn

B. Adjusting flow to the design value using its readout

C. Leaving it wide open in all cases

D. Matching it to the supply pipe colour

69. A dielectric fitting between dissimilar metals on a process line has corroded through quickly. The most likely cause is:

A. The fitting was too large for the pipe

B. The dielectric isolation was bridged or bypassed

C. The fluid temperature was too low

D. The line was flushed before service

70. A control valve "fails open" on loss of signal. This selection is appropriate when the safe condition for the process is:

A. No flow through the line

B. The valve held in its last position

C. Continued flow through the line

D. Venting the line to atmosphere

71. A long horizontal chilled-water main must be pitched and fitted with drains so that it can be:

A. Filled with air during operation

B. Drained completely for service

C. Operated without any insulation

D. Run at a steeper grade than steam

72. A heat exchanger's tube bundle is fouling rapidly on the water side. The most effective preventive measure is:

A. Increasing the steam pressure to the shell

B. Reducing the water flow to a trickle

C. Proper water treatment and periodic cleaning

D. Removing the strainer from the line

73. When commissioning process piping, a pressure test is held for the specified duration to:

A. Warm the system to operating temperature

B. Circulate chemicals through the loop

C. Establish the system's flow rate

D. Confirm there are no leaks or pressure loss

74. An expansion loop is sized for a steel process line. Making the loop legs longer will:

A. Increase its flexibility to absorb expansion

B. Reduce the line's ability to expand

C. Require the line to be anchored less

D. Have no effect on thermal stress

75. A reciprocating compressor discharge line vibrates and cracks fittings. The best mitigation is to:

A. Increase the line pressure further

B. Shorten the line as much as possible

C. Add pulsation dampening and proper supports

D. Remove all flexible connections

76. A geo-exchange ground loop is not delivering rated capacity in winter. After ruling out the heat pump, the most likely loop-side cause is:

A. The fluid is overheating in the loop

B. The borehole is too deep for the pump

C. The antifreeze concentration is too high

D. Air is trapped in the loop, reducing flow

77. A vertical closed-loop borehole field is grouted primarily to:

A. Allow groundwater to flow through freely

B. Make the loop easier to remove later

C. Increase the borehole diameter

D. Improve heat transfer and protect groundwater

78. A horizontal ground loop installed too shallow underperforms in deep winter because the soil at that depth:

A. Stays warmer than design all year

B. Drops near the seasonal frost temperature

C. Cannot transfer any heat at all

D. Is always saturated with water

79. A purge cart removes air from a geothermal loop by circulating fluid at a velocity high enough to:

A. Carry air bubbles out of the loop

B. Heat the fluid above boiling

C. Increase the loop's static pressure

D. Lower the antifreeze concentration

80. A solar thermal collector loop using a glycol heat-transfer fluid requires periodic checks because the glycol can:

A. Strengthen with repeated heating

B. Degrade and become acidic over time

C. Convert itself into pure water

D. Increase the collector efficiency yearly

81. A drain-back solar system controls overheating and freezing by:

A. Sealing the collectors permanently full

B. Adding 100% glycol to the loop

C. Letting the fluid drain to a tank when the pump stops

D. Venting the collectors to atmosphere always

82. Two geothermal heat pumps share one loop field and one unit consistently underperforms. The most likely loop-side cause is:

A. The shared loop is too short overall

B. The underperforming unit is newer

C. The fluid is the wrong colour

D. Unbalanced flow between the two circuits

83. A solar-plus-boiler domestic hot-water system is piped so the solar storage feeds the boiler inlet. This arrangement ensures the boiler:

A. Only tops up heat the solar input did not supply

B. Runs continuously regardless of solar gain

C. Never operates once solar is installed

D. Heats the collector fluid directly

84. A geothermal system's flow centre (pump module) is checked during commissioning to confirm the loop has:

A. Been filled with raw untreated water

B. Adequate flow and is free of air

C. The maximum possible pressure drop

D. No antifreeze in the fluid

85. A reverse-return piping layout is chosen for a solar collector array primarily to:

A. Reverse the flow direction at night

B. Provide naturally balanced flow across collectors

C. Eliminate the storage tank entirely

D. Drain the array after each cycle

86. A worker must select PPE for handling glycol concentrate during a system charge. The most relevant protection is:

A. Eye and skin protection against the chemical

B. Hearing protection for the pump noise

C. A fall-arrest harness for the work height

D. A respirator rated only for welding fumes

87. A lockout device is applied to a pump motor disconnect, but the line still has stored pressure. The next required step before work is to:

A. Begin work since the motor is locked out

B. Open the disconnect a second time

C. Tag the motor and leave the pressure alone

D. Relieve and verify zero stored energy in the line

88. When oxy-acetylene equipment is shut down at the end of a task, the correct general sequence is to:

A. Leave both cylinder valves open overnight

B. Close cylinder valves, bleed lines, and back out regulators

C. Close only the acetylene and leave oxygen on

D. Coil the hoses with the regulators still pressurized

89. A grinder's guard has been removed by a previous user to "reach a tight spot." Before using it, you should:

A. Use it as found to save time

B. Reinstall the guard before operating the tool

C. Grind only lightly without the guard

D. Remove the second handle as well

90. A portable ladder is set up on a smooth tile floor and tends to slip at the base. The best corrective measure is to:

A. Lean it at a steeper, more vertical angle

B. Have a second worker stand on the bottom rung only

C. Add weight to the top of the ladder

D. Secure the base and use slip-resistant feet

91. A pipe-threading machine produces tapered threads that are too long, so fittings bottom out and crack. The most likely setup error is the:

A. Cutting oil is the wrong colour

B. Reamer was used after threading

C. Pipe was cut with a wheel cutter

D. Die head set to open too late

92. A torque wrench has been dropped on a concrete floor. Before continued use it should be:

A. Re-verified or recalibrated for accuracy

B. Set to a higher value to compensate

C. Used only on small bolts

D. Returned to the rack without checking

93. A reamer leaves a rough internal bore after deburring a cut pipe. The most likely cause is a:

A. Pipe that was cut too square

B. Fresh, sharp reamer blade

C. Slow rotation speed only

D. Dull or damaged reamer

94. A magnetic drill's base will not hold on a piece of structural steel. The most likely cause is:

A. The steel is too thick for any drill

B. The drill bit is the wrong size

C. The power cord is too short

D. Paint, scale, or an uneven surface under the magnet

95. A pipe wrench keeps slipping on a fitting despite firm pressure. The most likely cause is:

A. The wrench is too large for the pipe

B. Worn, rounded teeth on the jaws

C. The pipe is too clean and dry

D. Two wrenches were used together

96. When using a chain hoist to position a valve, the hoist's hook is fitted with a safety latch to:

A. Increase the hoist's rated capacity

B. Prevent the load from slipping off the hook

C. Speed up the lifting operation

D. Allow side-loading of the hook

97. A GFCI on a temporary power supply trips repeatedly when a wet tool is connected. The correct interpretation is that the GFCI is:

A. Defective and should be bypassed

B. Set at too sensitive a level to be useful

C. Unnecessary in damp conditions

D. Detecting leakage current and protecting the worker

98. A laser level used to set pipe grade gives inconsistent readings outdoors at midday. The most likely cause is:

A. The pipe is the wrong material

B. The grade is too steep to measure

C. The battery is fully charged

D. Bright sunlight washing out the beam

99. A bench vise used to hold pipe for cutting is mounted loosely and shifts under load. The first corrective action is to:

A. Cut more quickly to finish before it moves

B. Secure the vise firmly to the bench

C. Hold the pipe by hand instead

D. Use a larger saw blade

100. Compressed-gas cylinders are being transported on a cart. The safest practice is to:

A. Lay them flat and unsecured for stability

B. Keep valve caps on and cylinders secured upright

C. Remove the caps to save time at the work area

D. Stack several cylinders horizontally together

101. A welder's flashback arrestor is tested and found to be stuck. The correct action is to:

A. Continue welding and replace it next month

B. Bypass it with a short hose section

C. Reverse the gas flow to clear it

D. Remove it from service and replace it

102. A new apprentice asks why pipe is reamed after cutting on a small water line. The best explanation is that reaming:

A. Adds threads for the next fitting

B. Increases the pipe's outside diameter

C. Restores full bore by removing the burr

D. Bevels the pipe for welding

103. A worker plans to use a cheater bar on a pipe wrench to free a stuck fitting. The most appropriate guidance is that this:

A. Always doubles the safe torque available

B. Is preferred practice for all stuck joints

C. Has no effect on the wrench's strength

D. Can overload the wrench and is generally discouraged

104. A digital manometer is the appropriate instrument when a steamfitter needs to measure:

A. The outside diameter of a pipe

B. The hardness of structural steel

C. The torque on a flange bolt

D. Low pressures or differential pressure

105. A pipe must be cut square for a butt weld but a hand hacksaw leaves an angled cut. The best corrective practice is to:

A. Grind the angled end until it looks square

B. Weld it as-is and add extra filler

C. Use a wrap-around or guide to mark and cut square

D. Cut the mating pipe at the same angle

106. A worker reports a portable tool gives a mild tingle when touched. The correct immediate action is to:

A. Continue using it with dry gloves

B. Tape over the casing for insulation

C. Apply more downforce to seat the plug

D. Remove it from service and have it inspected

107. A torque sequence for a flanged joint should follow a:

A. Single continuous sweep around the circle

B. Star/cross pattern in incremental passes

C. Random order to distribute the load

D. Order based on bolt colour only

108. A worker must store rigging slings between jobs. The best practice is to:

A. Leave them coiled on the wet ground

B. Hang them dry, away from heat and chemicals

C. Bundle them tightly in a sealed plastic bag

D. Store them next to the welding cylinders

109. A pipe spool fabricated in the shop is found to be 10 mm too long during field fit-up. Assuming the field dimension is correct, the most defensible action is to:

A. Force the spool in and stress the flanges

B. Add a gasket twice as thick to absorb it

C. Re-cut or rework the spool to the correct length

D. Spring the adjacent pipe to make it fit

110. A steamfitter must select a gasket for a 350°C steam flange. Compared with a rubber gasket, the appropriate choice is one rated for:

A. Cold water service only

B. The high temperature and pressure involved

C. The pipe's outside colour

D. Vacuum service exclusively

111. A drawing specifies a "field weld" symbol (a flag at the reference line). This tells the fabricator that the weld is to be made:

A. At the site rather than in the shop

B. With twice the normal reinforcement

C. Only by an automatic process

D. Without any inspection required

112. A pipe penetration through a fire-rated wall must be sealed with:

A. Ordinary spray foam insulation

B. Loose mineral wool packed by hand only

C. An approved fire-stop system

D. Standard duct tape around the pipe

113. A worker is assigned to torque flange bolts in a confined area near a hot line. The most important pre-task control is to:

A. Work as fast as possible to limit exposure

B. Confirm isolation, energy control, and burn protection

C. Skip the torque spec to save time

D. Remove guards to improve access

114. A piping isometric shows a "spec break" symbol on a line. This indicates a change in the:

A. Piping material or rating along the line

B. Direction of fluid flow only

C. Drawing scale used

D. Welder assigned to the joint

115. A flow arrow on a check valve body must be installed so it points:

A. Against the intended direction of flow

B. In the direction of the intended flow

C. Toward the nearest support

D. Toward the relief valve only

116. A pump is cavitating on its suction. The most likely piping-side cause is:

A. Insufficient net positive suction head available

B. The discharge valve is wide open

C. The motor is rotating too slowly

D. The pump is mounted too low

117. When tightening a flange against a warped face, the correct response is to:

A. Apply extra torque until it seals

B. Add a thicker gasket and over-bolt it

C. Use a longer wrench for more leverage

D. Repair or replace the flange face first

118. A steamfitter must verify a relief valve's set pressure during commissioning. This is properly confirmed by:

A. A documented test against the stamped set point

B. Visual inspection of the spring only

C. Tapping the valve body lightly

D. Comparing it to a different valve nearby

119. A welded joint shows a row of small surface holes after the cap pass. This defect is:

A. Surface porosity, often from contamination or moisture

B. Normal weld reinforcement

C. A required inspection mark

D. Intentional venting of the joint

120. A pipe support spring hanger is selected (rather than a rigid hanger) where the pipe:

A. Never moves at all during operation

B. Must be anchored rigidly in place

C. Moves vertically due to thermal expansion

D. Carries no load whatsoever

121. A line must be sloped for drainage at 1% grade over a 20 m run. The total fall is:

A. 100 mm

B. 200 mm

C. 20 mm

D. 2 mm

122. A flange's bolt holes must "straddle the centreline" (two-hole) on a vertical pipe. This convention ensures:

A. Consistent, predictable bolt orientation

B. The flange carries twice the load

C. The gasket is no longer needed

D. The bolts can be left finger-tight

123. A steamfitter must support a horizontal run of insulated cold pipe. To prevent crushing the insulation, the support should use:

A. A load-bearing insulation shield or saddle

B. A bare clamp directly on the pipe

C. No support under insulated sections

D. A single point support every 30 m

124. A relief valve discharge pipe is run to a safe location and sized so that it:

A. Restricts the valve's relieving capacity

B. Terminates inside the occupied space

C. Does not create back-pressure beyond limits

D. Is smaller than the valve outlet

125. A steamfitter notices a steam main with no provision for expansion on a long straight run between two anchors. The most likely consequence is:

A. The pipe will run cooler than designed

B. Lower steam velocity in the main

C. High stress and possible buckling or damage

D. Improved drainage of condensate

126. A pipe is to be installed with a union so that a section can be removed later. The union should be located:

A. Buried inside a concrete wall

B. Behind a permanently welded joint

C. Where it is inaccessible by design

D. At an accessible point for future service

127. A steamfitter selects a valve for frequent throttling on a process water line. The best general choice is a:

A. Gate valve used partially open

B. Check valve held cracked open

C. Globe valve designed for throttling

D. Plug valve locked at one position

128. During hydrostatic testing, trapped air in a high point causes an unstable pressure reading. The correct remedy is to:

A. Vent the air from the high point and refill

B. Increase the test pressure to compress it

C. Ignore the reading and pass the test

D. Drain the entire system and start dry

129. A steamfitter reviews an as-built drawing that differs from the field installation. The correct practice is to:

A. Update the documentation to reflect actual conditions

B. Discard the as-built since the field is correct

C. Re-route the field pipe to match the old drawing

D. Ignore the difference entirely

130. Before energizing a completed steam system, the commissioning lead confirms drip legs, traps, supports, tests, and documentation are complete. This final verification primarily ensures the system is:

A. Painted to the correct colour scheme

B. The largest size physically possible

C. Stripped of all temporary supports

D. Safe and ready for reliable service

Practice Exam 1: Answer Key and Explanations

1. B — The recovery position keeps the airway open and lets fluids drain in an unresponsive person who is breathing normally. Chest compressions are only for someone without normal breathing or a pulse, and rolling the worker to a stable side-lying position prevents airway obstruction while help arrives.

2. C — WHMIS 2015 requires the safety data sheet be consulted before handling a hazardous product, regardless of past experience. Familiarity is not a substitute for documented hazard, handling, and first-aid information, so the SDS governs safe use.

3. C — A damaged cord makes a tool unsafe, so it must be tagged out and removed from service until properly repaired. Taping or partial fixes leave the shock hazard in place; lockout/tagout principles require defective equipment be taken out of use.

4. D — Coordinating the lift, keeping the load close to the body, and clearing the path control the main injury factors in a team carry. Communication and a planned route prevent the awkward twisting and sudden loads that cause back and shoulder strains.

5. D — A hot-work permit verifies that fire hazards have been assessed and controlled and that a fire watch is in place before ignition sources are used. An extinguisher alone does not confirm the area is prepared; the permit documents that the controls exist.

6. C — Atmospheres stratify, so a single reading at the manway can miss heavier-than-air vapours pooled lower in the tank. Testing at multiple depths before entry confirms the whole space is safe and prevents entering an undetected hazardous layer.

7. A — An unguarded edge is a fall hazard that must be protected immediately, by restoring the guardrail or otherwise covering the opening. Deferring the fix or relying on tape leaves workers exposed to a fall in the interim.

8. A — "FF" designates a flat-face flange, whose full gasket surface mates with another flat face. Identifying the face type matters because it dictates the correct gasket and prevents mismatching with a raised-face flange.

9. C — Field-measuring the actual face-to-face gap captures the real installed dimension, which can differ from nominal drawing figures due to tolerances. Cutting to the measured gap ensures the spool fits without forcing the flanges or leaving a gap.

10. B — "TOS" means top of steel, an elevation reference taken from the top surface of structural steel. It is used to set and verify the height of supports and pipe relative to the building structure.

11. B — For a 60° offset, travel equals set × 1.155 (1 ÷ sin 60°). The constant comes from the right-triangle relationship at 60°, where the set is the side opposite the angle.

12. B — Travel = set × 1.155 = 500 × 1.155 ≈ 577 mm. The 60° offset forms a right triangle where the hypotenuse (travel) is the set divided by sin 60°.

13. B — Travel = true offset × 1.414 for 45° fittings = 400 × 1.414 ≈ 566 mm. In a rolling offset the diagonal (true offset) is treated as the set, and at 45° the travel is that value times 1.414.

14. B — The wrap-around's edge must be square (perpendicular) to the pipe axis so the transferred line is a true circumference. An angled wrap produces a skewed cut line and a poor branch fit.

15. A — The land (root face) is the flat, unbeveled portion at the bottom of the bevel. It controls root opening and burn-through during the root pass, so its dimension is part of correct joint preparation.

16. C — DN 50 corresponds to 2 NPS, since DN is the metric nominal designation. Knowing the equivalence lets a fitter match metric drawings to imperial pipe and fittings.

17. D — Over-tightening with excess sealant on a brittle fitting wedges the tapered threads outward and cracks or splits it. The taper converts torque into hoop stress, so excessive make-up fractures the component.

18. A — The attachment point must be chosen for the structure's ability to carry the imposed load, including the pipe, contents, and any movement. Anchoring to inadequate structure risks failure regardless of how convenient the location is.

19. B — A double slash through a pipe symbol denotes a break or interruption in the drawing, showing the line continues elsewhere. It is a drafting convention, not a physical feature of the pipe.

20. B — "WN" is a weld-neck flange, which has a tapered hub welded to the pipe. Its long neck distributes stress and suits high-pressure or cyclic service, which is why the callout specifies it.

21. C — Tack welds hold alignment and root spacing while the joint is welded out. They prevent the gap from closing or shifting under heat, but they are temporary and become part of the root pass, not the final reinforcement.

22. A — A rise of 1.2 m over a run of 1.2 m gives equal legs, which is a 45° offset (the angle whose opposite and adjacent sides are equal). The equal set and run define a 45° triangle.

23. A — A grooved mechanical coupling seals by engaging a gasket and a two-part housing seated in grooves rolled or cut into the pipe ends. The housing keys into the grooves to hold the joint and the gasket makes the seal, without welding or threading.

24. D — In a "150 × 150 × 100" tee, the third number is the branch (outlet) nominal size. The first two give the run size and the last identifies the reducing outlet, so a fitter orders the correct branch.

25. B — Measuring from an established reference line or benchmark gives consistent, accurate layout because all dimensions share one datum. Measuring from random or shifting features compounds errors across the layout.

26. C — Shallow, leaking threads are typically produced by worn or improperly set dies that do not cut to full depth. Correctly set, sharp dies produce the full taper needed for the threads to seal.

27. D — Welds should be located to avoid supports and remain accessible for inspection and any future repair. Placing welds at supports or hidden in penetrations blocks examination and makes maintenance difficult.

28. C — At 45° each leg's tension exceeds half the load because the sling angle adds a horizontal force component. Only a vertical pick splits the load into equal halves; the shallower the angle, the higher the leg tension.

29. D — A single lift director controlling both cranes is essential in a tandem lift to coordinate motion and load sharing. Independent operation risks overloading one crane or swinging the load, so one authority directs the lift.

30. D — A permanent kink in the rope body has crushed and distorted the strands, permanently weakening the sling, so it must be removed from service. Kinks cannot be straightened back to original strength.

31. A — If the centre of gravity is not centred between the pick points, the load tilts toward the heavier side when raised. An off-centre pick unevenly loads the slings and can cause the load to swing or shift.

32. A — Melted or glazed fibres indicate heat or chemical damage, which degrades a synthetic sling's strength, so it must be removed from service. Such damage is not reversible and can lead to sudden failure.

33. D — Turning a load over safely requires a planned tip/turn procedure with controlled rigging so the load is supported throughout the rotation. Free-swinging or striking the load creates uncontrolled motion and shock loading.

34. B — Loading a shackle pin sideways reduces its effective capacity because the rating assumes in-line loading. Side-loading bends the pin and bow, so the safe load must be derated below the stamped value.

35. A — A spreader bar is loaded primarily in compression along its length, holding the sling tops apart. This differs from a lifting beam, which carries the load in bending, and the distinction governs how each is rated.

36. D — A stationary clenched fist is the standard hand signal for stop. Recognizing it instantly is critical because any worker may need to halt a lift when a hazard appears.

37. B — Working load limit = breaking strength ÷ design factor = 10,000 ÷ 2 = 5,000 kg. A 2:1 factor means the safe working load is half the breaking strength, providing margin against shock and wear while staying well below failure.

38. B — Corner protectors (softeners) shield a synthetic sling from being cut at a sharp edge. The padding spreads the bearing area so the load edge does not sever the webbing under tension.

39. C — A crane's rated capacity decreases as the load radius increases from the centre of rotation. Greater radius increases the overturning moment, so the load chart reduces allowable load at longer radii.

40. A — A steam system operating above 103 kPa (15 psig) gauge is classified as high-pressure. The threshold separates low-pressure heating systems from high-pressure systems subject to stricter code requirements.

41. C — Morning banging on a steam main is classically caused by condensate left in the line being driven by incoming steam. Draining the main through drip legs and traps before admitting steam prevents the water-hammer impact.

42. A — An inverted-bucket trap loses prime when a sudden pressure drop flashes off its water seal, leaving the bucket unable to float, so it blows steam. Restoring the seal and protecting against rapid pressure swings prevents this failure.

43. C — Stall occurs when the trap cannot discharge condensate against the back-pressure at low load, flooding the exchanger. Correcting trap capacity or adding pump/pressure provisions restores drainage on modulating loads.

44. D — A drip leg ahead of a control valve captures condensate before it reaches the valve, protecting it and preventing water hammer. The pocket lets water fall out of the steam and drain to a trap.

45. A — A grossly oversized PRV hunts because it must operate near its seat to pass a small load, causing it to cycle open and closed. Right-sizing the valve to the actual load stabilizes control.

46. B — The warm-up (bypass) valve admits steam slowly and lets condensate drain, bringing the main up to temperature gradually. This prevents thermal shock and water hammer that rapid full-flow start-up would cause.

47. C — A weeping safety valve has a damaged seat or has lost set integrity and must be repaired or replaced per the code. Raising pressure or gagging the valve defeats its protective function and is prohibited.

48. D — Cold far-end radiators with warm near ones point to air binding or undersized piping that starves the far end of steam. Proper venting and correct pipe sizing restore distribution to the end of the run.

49. A — A trap blowing continuously with no condensate has failed open and is passing live steam. This wastes energy to the return; the trap must be repaired or replaced to restore the steam barrier.

50. B — A flash tank recovers usable low-pressure flash steam from high-pressure condensate released to lower pressure. Capturing that flash steam for low-pressure loads improves overall system efficiency.

51. C — A deaerator removes dissolved oxygen and other gases from boiler feedwater. Eliminating oxygen is critical because it causes pitting corrosion in the boiler and piping.

52. A — The discharge check valve prevents backflow into the condensate pump when it stops. This keeps the discharge line from draining back and protects the pump and system from reverse flow.

53. A — A trap must be sized for the maximum condensate load with an adequate safety factor so it can clear condensate under worst-case conditions. Sizing for minimum load would cause flooding when demand rises.

54. D — A steam separator removes entrained moisture from the steam, delivering drier steam downstream. Drier steam improves heat transfer and reduces erosion and water hammer in equipment.

55. C — Short-cycling on the high-limit usually indicates insufficient flow through the boiler, letting the water overheat locally. Restoring proper flow lets the boiler transfer heat to the loop instead of tripping the limit.

56. C — Installing an air vent at the high point lets accumulated air escape where it collects. Air rises to high points and blocks circulation, so venting there clears the trapped pocket.

57. B — A single cold zone with others working points to that zone's valve or circulator, not the boiler or common controls. Checking the zone-specific device isolates the fault to the affected circuit.

58. A — Over-pressurizing the cold-fill setting drives system pressure above the relief valve setting, so the valve discharges water. Correct fill pressure keeps the system below the relief point.

59. B — Closely spaced tees hydraulically decouple the loops so the secondary pump moves flow in its circuit without affecting primary flow. The negligible pressure drop between the tees isolates the two pumps.

60. B — A sweating, dripping chilled-water coil indicates missing or damaged insulation and vapour barrier, letting warm moist air condense on cold surfaces. Restoring the barrier stops condensation and protects equipment below.

61. C — Glycol concentration is verified with a refractometer or hydrometer, which reads the fluid's freeze-protection level directly. Pressure and flow instruments cannot measure concentration, so the proper tool confirms the mix.

62. A — A three-way diverting valve sends flow to one of two outlet paths from a single inlet. This routing controls which circuit receives flow, unlike a mixing valve that blends two inlets.

63. A — Condenser-water treatment controls scale, corrosion, and biological growth in the open cooling-tower loop. The tower exposes the water to air and contaminants, so treatment protects the loop and equipment.

64. C — Repeated support failure at one point on a hot line indicates thermal expansion forces are not being accommodated. Adding loops, joints, or proper guides and anchors relieves the stress causing the failures.

65. C — A globe valve installed against its flow arrow tends to slam shut or chatter because pressure acts to close the disc improperly. Installing it with the flow direction lets pressure assist seating and stable control.

66. D — A strainer that clogs soon after each cleaning signals an ongoing debris source that must be found and eliminated, then the system flushed. Treating the symptom by cleaning repeatedly ignores the root cause.

67. D — A relief valve is sized to the boiler's maximum heat input/relieving capacity so it can pass the energy the boiler can add. Undersizing would let pressure climb despite the valve being open.

68. B — A balancing valve with a flow-measuring feature is set by adjusting flow to the design value using its readout. The integral measurement lets the installer dial in the correct flow rather than guessing.

69. B — Rapid corrosion of a dielectric fitting means the isolation was bridged or bypassed, allowing galvanic current to flow. A metallic bypass defeats the dielectric break, so the path must be found and isolated.

70. C — A "fail open" valve is chosen when continued flow is the safe condition on loss of signal, such as cooling that must not stop. The fail position is selected so a failure leaves the process safe.

71. B — A chilled-water main is pitched with drains so it can be drained completely for service and to remove condensate or air. Proper slope and low-point drains let the line be emptied for maintenance.

72. C — Rapid water-side fouling is best controlled by proper water treatment and periodic cleaning. Treatment limits scale and biological growth, and scheduled cleaning restores heat transfer.

73. D — A pressure test is held for the specified time to confirm there are no leaks or pressure loss in the system. A stable held pressure verifies joint integrity before the system is placed in service.

74. A — Lengthening the loop legs increases the loop's flexibility to absorb pipe expansion. Longer legs bend more easily, lowering the stress the thermal growth imposes on the pipe and anchors.

75. C — Vibration and cracking from a reciprocating compressor are mitigated with pulsation dampening and proper supports. Dampers absorb the pressure pulses and supports restrain the line, reducing fatigue at fittings.

76. D — When the heat pump checks out, trapped air reducing loop flow is the most likely loop-side cause of low capacity. Air blocks circulation and lowers heat transfer, so purging the loop restores flow.

77. D — Boreholes are grouted to improve heat transfer between the loop and the earth and to protect groundwater from cross-contamination. The grout seals the bore and conducts heat to the surrounding ground.

78. B — A shallow horizontal loop underperforms in deep winter because the soil at that depth drops toward the seasonal frost temperature. Burying below the frost line keeps the loop in stable-temperature ground.

79. A — A purge cart circulates fluid fast enough to carry entrained air bubbles out of the loop to the purge tank. High velocity sweeps the air along rather than letting it stagnate at high points.

80. B — Glycol heat-transfer fluid degrades and can become acidic over time, especially under high collector temperatures, so it needs periodic checking. Acidic, depleted fluid corrodes components and loses freeze protection.

81. C — A drain-back system lets the collector fluid drain to a tank when the pump stops, protecting against both freezing and stagnation overheating. With no fluid in the collectors when idle, there is nothing to freeze or overheat.

82. D — When two heat pumps share a loop and one underperforms, unbalanced flow between the circuits is the likely loop-side cause. Balancing valves set each circuit's flow so neither unit is starved.

83. A — Feeding solar storage to the boiler inlet lets the boiler only top up the heat that solar did not supply. The boiler makes up the difference to setpoint, maximizing the free solar contribution.

84. B — The flow centre is checked to confirm the loop has adequate flow and is free of air during commissioning. Proper flow and an air-free loop are essential for the heat pump to reach rated capacity.

85. B — A reverse-return layout equalizes the total path length to each collector, providing naturally balanced flow. Because every circuit travels a similar distance, flow distributes evenly without extensive manual balancing.

86. A — Handling glycol concentrate calls for eye and skin protection against the chemical, since it can irritate eyes and skin. The relevant hazard is chemical contact, so PPE is matched to that exposure.

87. D — After locking out the motor, stored pressure in the line must be relieved and verified at zero before work begins. Electrical lockout does not address hydraulic energy, so all energy sources must be controlled.

88. B — Proper shutdown is to close the cylinder valves, bleed the lines, and back out the regulator adjusting screws. This relieves pressure and prevents creep or leakage that could create a hazard when idle.

89. B — A grinder's guard must be reinstalled before the tool is operated, because it protects the user from wheel fragments. Running a guard-less grinder exposes the operator to a burst-wheel hazard.

90. D — A ladder slipping on a smooth floor is corrected by securing the base and using slip-resistant feet. Stabilizing the base addresses the cause; steeper angles or top weight do not prevent the foot from sliding.

91. D — Threads that are too long, letting fittings bottom out and crack, indicate the die head is set to open too late. Setting the head to open at the correct length produces the proper thread engagement.

92. A — A dropped torque wrench must be re-verified or recalibrated, because impact can shift its accuracy. An out-of-calibration wrench can over- or under-torque bolts, so its accuracy must be confirmed before use.

93. D — A rough bore after deburring points to a dull or damaged reamer that tears rather than cleanly cuts. A sharp reamer leaves a clean bore, so the worn tool should be replaced.

94. D — A magnetic drill base that will not hold is usually caused by paint, scale, or an uneven surface breaking the magnetic contact. Cleaning to bare, flat steel restores the holding force needed for safe drilling.

95. B — A pipe wrench that slips despite firm pressure usually has worn, rounded teeth that cannot bite the pipe. Sharp teeth are required to grip; rounded jaws should be replaced.

96. B — A hook's safety latch prevents the load or sling from slipping off the hook. It closes the throat opening so the rigging cannot jump out during the lift.

97. D — A GFCI tripping with a wet tool means it is detecting leakage current and protecting the worker, exactly as intended. The correct response is to remove the faulty tool from service, never to bypass the device.

98. D — Inconsistent laser-level readings outdoors at midday are typically caused by bright sunlight washing out the beam. Using a laser detector or shading the work restores a usable reference.

99. B — A loose vise that shifts under load must first be secured firmly to the bench. A solid mounting lets the vise resist cutting forces so the pipe stays put and the work is safe.

100. B — Cylinders on a cart should have valve caps on and be secured upright. Caps protect the valves and upright securing prevents tipping and the dangerous release that a broken valve could cause.

101. D — A stuck flashback arrestor has failed and must be removed from service and replaced. The device's whole purpose is to stop a flame from reaching the hoses, so a defective one cannot be bypassed or reused.

102. C — Reaming restores the full bore by removing the internal burr left from cutting. The burr restricts flow and causes turbulence, so removing it returns the pipe to full inside diameter.

103. D — A cheater bar can overload a pipe wrench beyond its design strength and is generally discouraged. The added leverage can break the wrench or the fitting, creating a sudden-release hazard.

104. D — A manometer measures low pressures or differential pressure, such as draft or system pressure differences. It is the right instrument for small pressure readings, not for dimensions, hardness, or torque.

105. C — An angled hand-saw cut is best corrected by using a wrap-around or guide to mark and cut square. The guide gives a true perpendicular line so the butt joint fits without excessive grinding.

106. D — A tool giving a tingle has a ground fault or insulation breakdown and must be removed from service and inspected. The tingle signals leakage current that can escalate to a serious shock.

107. B — Flange bolts are tightened in a star/cross pattern over incremental passes to seat the gasket evenly. Gradual, alternating tightening prevents cocking the flange and produces uniform gasket compression.

108. B — Slings should be stored hung dry, away from heat and chemicals, to preserve their strength. Moisture, heat, and chemical exposure degrade webbing and rope, so proper storage extends safe service life.

109. C — A spool found 10 mm too long against a correct field dimension should be re-cut or reworked to the correct length. Forcing it or padding gaskets stresses the joint; the spool must match the real dimension.

110. B — A 350°C steam flange requires a gasket rated for the high temperature and pressure involved, such as a spiral-wound type. A rubber gasket would fail at steam temperatures, so the material must suit the service.

111. A — A flag at the reference-line junction of a weld symbol designates a field weld, made at the site rather than in the shop. The symbol tells the fabricator which welds are deferred to field installation.

112. C — A pipe penetration through a fire-rated wall must be sealed with an approved fire-stop system to maintain the rating. Ordinary foam or tape does not restore the fire resistance the assembly requires.

113. B — Working near a hot line in a confined area requires confirming isolation, energy control, and burn protection first. Controlling the thermal and stored-energy hazards before starting prevents burns and injury.

114. A — A spec-break symbol marks a change in piping material or rating along the line. It tells the installer where the specification transitions so the correct components are used on each side.

115. B — A check valve must be installed with its flow arrow pointing in the intended direction of flow. The valve only allows flow that way and blocks reverse flow, so orientation is essential to function.

116. A — Cavitation on the suction is most often caused by insufficient net positive suction head available. When suction pressure drops near the vapour pressure, vapour bubbles form and collapse, damaging the pump.

117. D — A warped flange face must be repaired or replaced before bolt-up, because extra torque or a thicker gasket will not seal a distorted face. Restoring a flat sealing surface is the only reliable fix.

118. A — Relief-valve set pressure is confirmed by a documented test against the stamped set point. Only an actual lift test verifies the valve opens at the correct pressure; visual checks cannot confirm the setting.

119. A — A row of small surface holes after the cap pass is surface porosity, typically from contamination or moisture in the weld zone. The trapped gas leaves voids, indicating the joint needs cleaning and rewelding.

120. C — A spring hanger is selected where the pipe moves vertically from thermal expansion, because it supports the load while allowing movement. A rigid hanger would restrain the pipe and transfer stress instead.

121. B — Fall = grade × run = 0.01 × 20 m = 0.2 m = 200 mm. A 1% slope drops one unit per hundred, so over 20 m the total fall is 200 mm.

122. A — "Straddling the centreline" (two-hole) places the bolt holes symmetrically about the vertical centreline, giving consistent, predictable bolt orientation. This standard convention lets flanges mate and bolts line up reliably.

123. A — Insulated cold pipe is supported with a load-bearing insulation shield or saddle to spread the load and protect the insulation and vapour barrier. A bare clamp would crush the insulation and break the vapour seal.

124. C — A relief-valve discharge pipe must be sized and routed so it does not create back-pressure beyond limits, which would impair relief. Excess back-pressure reduces the valve's capacity, so the discharge must flow freely to a safe location.

125. C — A long straight steam run between anchors with no expansion provision builds high stress and can buckle or damage the pipe. Thermal growth must go somewhere, so loops or joints are required to relieve it.

126. D — A union meant to allow later removal must be located at an accessible point for future service. Burying or blocking it defeats its purpose, so it is placed where it can be reached and broken.

127. C — A globe valve designed for throttling is the best choice for frequent flow regulation, because its seat geometry controls flow well. Gate and similar valves are meant for isolation and erode when throttled.

128. A — Trapped air at a high point during a hydrostatic test is remedied by venting the air and refilling. Air compresses and gives unstable readings, so removing it leaves a solid water column for an accurate test.

129. A — When an as-built differs from the field, the correct practice is to update the documentation to reflect actual conditions. Accurate as-builts are essential for future maintenance, so the record is corrected to match reality.

130. D — Confirming drip legs, traps, supports, tests, and documentation before energizing verifies the system is safe and ready for reliable service. The final check ensures nothing required for safe operation is missing.