CSWIP 3.1 Theory Part 1

Welding Inspection Theory | 25 free practice questions

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1. If voltage and current remain constant while travel speed doubles, what happens to arc energy per unit length?

A. It doubles
B. It remains unchanged
C. It halves
D. It increases fourfold

Correct answer: C. It halves

Explanation: Energy per unit length is inversely proportional to travel speed at fixed electrical power. Twice the speed gives half the energy per millimetre.

2. A concave fillet has equal 8 mm legs. Why should its throat not simply be accepted as 5.66 mm?

A. Leg length is measured through the weld face
B. Equal legs guarantee the design throat
C. The concave face can reduce the actual throat below the ideal triangular value
D. Concavity always doubles penetration

Correct answer: C. The concave face can reduce the actual throat below the ideal triangular value

Explanation: The 0.707 factor describes an ideal flat-faced right-angle fillet. Concavity changes the limiting cross-section; the throat must satisfy the specified requirement.

3. Why may an incorrect filler metal composition be unacceptable even when the weld looks sound?

A. It guarantees higher ductility
B. It affects only the weld colour
C. It changes only the drawing number
D. It can alter strength, toughness or corrosion performance

Correct answer: D. It can alter strength, toughness or corrosion performance

Explanation: Appearance does not establish deposited-metal properties. Correct filler selection and traceability are essential for the specified service and procedure.

4. What is a key purpose of maintaining filler wire batch identification?

A. Determine weld size without measurement
B. Replace welder identification
C. Link consumable properties and certificates to the material used
D. Establish the exact travel speed

Correct answer: C. Link consumable properties and certificates to the material used

Explanation: Batch traceability links the actual consumables to their certification and issue records, helping demonstrate compliance and investigate nonconformances.

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5. A symmetrical single-V preparation has a 32 degree bevel on each member. What is the included angle?

A. 148 degrees
B. 32 degrees
C. 58 degrees
D. 64 degrees

Correct answer: D. 64 degrees

Explanation: The included angle is the sum of the two bevel angles in this symmetric preparation: 32 + 32 = 64 degrees.

6. Which fabrication approach can help reduce angular distortion in a double-sided joint?

A. Increase weld volume without limit
B. Balanced deposition on opposite sides using an approved sequence
C. Complete all oversized welds on one side first
D. Remove all tack welds before positioning

Correct answer: B. Balanced deposition on opposite sides using an approved sequence

Explanation: Balancing shrinkage around the joint can reduce rotation. The selected sequence must remain compatible with access, procedure and quality requirements.

7. A conventional film radiograph shows a small bright inclusion in a TIG weld. Which material is a plausible cause?

A. Trapped gas
B. An open pore
C. Tungsten
D. Slag of lower density than steel

Correct answer: C. Tungsten

Explanation: Tungsten attenuates X-rays more strongly than surrounding steel and can produce a lighter film image. Gas pores typically produce darker indications on conventional film.

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8. Which combination most directly increases hydrogen cracking risk in ferritic steel?

A. High ductility, clean joint and controlled cooling
B. Inert shielding, low hardenability and low stress
C. Low hydrogen, ductile microstructure and low restraint
D. Diffusible hydrogen, susceptible microstructure and tensile stress

Correct answer: D. Diffusible hydrogen, susceptible microstructure and tensile stress

Explanation: Hydrogen cracking requires interacting metallurgical and mechanical conditions, often after cooling. Appropriate hydrogen control, preheat and restraint management reduce risk.

9. What risk arises if recovered SAW flux is contaminated with moisture or debris?

A. Porosity or other weld-quality problems
B. Guaranteed higher toughness
C. Automatic reduction of hydrogen
D. Elimination of slag inclusions

Correct answer: A. Porosity or other weld-quality problems

Explanation: Flux condition influences shielding, chemistry and hydrogen content. Reuse, screening and drying must comply with manufacturer instructions and the approved procedure.

10. Why is the arc normally not visible during submerged arc welding?

A. A blanket of granular flux covers the arc
B. The arc burns inside a tungsten electrode
C. The workpiece is always transparent
D. The process uses no electrical arc

Correct answer: A. A blanket of granular flux covers the arc

Explanation: The granular flux surrounds the arc, providing shielding and forming slag. This also limits direct observation of the molten pool.

11. What property describes a metal's ability to undergo plastic deformation before fracture?

A. Ductility
B. Thermal conductivity
C. Elastic modulus
D. Hardness

Correct answer: A. Ductility

Explanation: Ductility describes plastic deformation capacity and may be indicated by elongation or reduction of area in a tensile test. Hardness concerns resistance to indentation.

12. How does suitable preheating help reduce hydrogen cracking susceptibility in many ferritic steels?

A. It slows cooling and can promote hydrogen diffusion
B. It increases quench severity
C. It guarantees zero residual stress
D. It removes the need for consumable control

Correct answer: A. It slows cooling and can promote hydrogen diffusion

Explanation: Preheating can reduce cooling rate, lessen hard microstructure formation and allow more time for hydrogen diffusion. It is one part of the approved cracking-control strategy.

13. Why can higher carbon content increase welding difficulty in ferritic steels?

A. It eliminates hydrogen absorption
B. It guarantees lower hardness after rapid cooling
C. It can increase hardenability and susceptibility to hard HAZ microstructures
D. It removes tensile residual stress

Correct answer: C. It can increase hardenability and susceptibility to hard HAZ microstructures

Explanation: Carbon promotes hard transformation products under suitable cooling conditions. Together with hydrogen and tensile stress, this may increase cold cracking risk.

14. A tensile specimen has an original cross-sectional area of 80 mm2 and reaches a maximum load of 44 kN. What is its tensile strength?

A. 55 MPa
B. 440 MPa
C. 352 MPa
D. 550 MPa

Correct answer: D. 550 MPa

Explanation: Engineering tensile strength is maximum load divided by original area: 44,000 N / 80 mm2 = 550 N/mm2, equivalent to 550 MPa.

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15. Two acceptance standards give different allowable limits for the same imperfection. Which should the inspector use?

A. Always the newest document regardless of contract
B. The applicable contractually specified standard and edition
C. The limit used on the previous job
D. Always the least restrictive standard

Correct answer: B. The applicable contractually specified standard and edition

Explanation: Acceptance is application-specific. The governing contractual and regulatory requirements determine the relevant criteria; discrepancies must be resolved through authorised channels.

16. Which gauge is most directly suited to measuring internal offset between pipe ends during fit-up?

A. Internal high-low gauge
B. Charpy pendulum
C. Coating thickness gauge
D. Surface roughness comparator

Correct answer: A. Internal high-low gauge

Explanation: A high-low gauge is designed to quantify pipe-end misalignment when access and geometry permit. The measured offset is compared with the applicable fit-up tolerance.

17. In a conventional AWS E7018 classification, what does 70 indicate?

A. Minimum deposited weld-metal tensile strength of 70 ksi under classification test conditions
B. 70 A maximum current
C. 70 percent elongation
D. 70 MPa yield strength

Correct answer: A. Minimum deposited weld-metal tensile strength of 70 ksi under classification test conditions

Explanation: The tensile strength designation is expressed in thousands of pounds per square inch for this classification. It is not a production joint acceptance guarantee.

18. Why is conventional SAW mainly suited to flat or suitably positioned horizontal welds?

A. Granular flux and a large molten pool must be retained in position
B. Its electrode cannot be fed continuously
C. It cannot weld carbon steel
D. It requires no weld preparation

Correct answer: A. Granular flux and a large molten pool must be retained in position

Explanation: Gravity affects the retention of flux and molten metal. The process is commonly mechanised in positions where these can be controlled.

19. What is a likely consequence of dipping the TIG tungsten into the molten pool?

A. Tungsten contamination of the weld
B. Automatic reduction of root gap
C. Increased electrode flux coverage
D. Cellulosic slag formation

Correct answer: A. Tungsten contamination of the weld

Explanation: Contact with molten metal can contaminate the tungsten and introduce tungsten particles into the weld. The affected electrode and weld should be addressed under the procedure.

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20. On an ISO-style fillet weld symbol, a6 specifies which dimension?

A. Root face of 6 mm
B. Nominal throat of 6 mm
C. Leg length of 6 mm
D. Weld length of 6 mm

Correct answer: B. Nominal throat of 6 mm

Explanation: The prefix a specifies nominal throat thickness in the ISO convention, not leg length. For an ideal equal-leg right-angle fillet, a 6 mm throat corresponds to about 8.49 mm legs.

21. A WPS specifies minimum preheat of 100 C and maximum interpass temperature of 220 C. Before the next pass the measured temperature is 245 C. What is required?

A. Weld immediately because minimum preheat is exceeded
B. Ignore interpass temperature for multi-run welding
C. Increase temperature to 300 C
D. Wait until temperature is within the permitted range

Correct answer: D. Wait until temperature is within the permitted range

Explanation: Both limits must be met. The measured temperature exceeds the maximum interpass limit by 25 C; welding should resume only when permitted conditions are restored.

22. Porosity increases in a gas-shielded weld after the operator raises gas flow far beyond the qualified setting. Why?

A. Higher flow always increases gas purity
B. The gas converts into slag
C. Turbulence can draw surrounding air into the shielding stream
D. Higher flow prevents gas escape by increasing metal hardness

Correct answer: C. Turbulence can draw surrounding air into the shielding stream

Explanation: Excessive flow can disturb shielding and entrain air. The correct remedy is to investigate the shielding system and restore the approved flow, not continually increase it.

23. Which test measures energy absorbed during rapid fracture of a notched specimen at a specified temperature?

A. Macro examination
B. Vickers hardness test
C. Transverse tensile test
D. Charpy impact test

Correct answer: D. Charpy impact test

Explanation: Charpy testing measures absorbed impact energy, usually in joules. The specified temperature and notch location are important to interpretation of weld toughness.

24. An ideal flat-faced equal-leg fillet in a 90 degree joint has 10 mm legs. What is its theoretical throat to two decimals?

A. 7.07 mm
B. 5.00 mm
C. 14.14 mm
D. 10.00 mm

Correct answer: A. 7.07 mm

Explanation: The perpendicular altitude of the right isosceles triangle is leg length divided by square root of two. Thus 10 / 1.4142 = 7.07 mm, ignoring additional penetration.

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25. Which variable primarily controls welding current in conventional constant-voltage solid-wire MAG welding when other settings are stable?

A. Nozzle diameter alone
B. Wire feed speed
C. Workpiece thickness alone
D. Gas cylinder pressure

Correct answer: B. Wire feed speed

Explanation: Increasing wire feed speed generally increases the current needed to melt the wire at the maintained arc condition. Voltage primarily influences arc length; actual behaviour depends on the system.

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