MULTICHOICE PAPER ONE

1. When 'hydrogen control' is specified for a manual metal arc welding project the electrode would normally be:
   a. Cellulose
   b. Iron oxide
   c. Acid
   d. Basic

2. You would certainly recognise a hydrogen controlled flux covered electrode from its:
   a. Colour
   b. Length
   c. Trade name
   d. BS639/AWS code letter

3. When manual metal arc welding is being carried out on an open construction site, which group of welders are most likely to require continuous monitoring?
   a. Concrete shuttering welding teams
   b. Pipe welding teams
   c. Plate welders
   d. Plant maintenance welders

4. You notice manual metal arc electrodes, stripped of flux, are being used as filler wire for TIG welding. You would object because:
   a. It is too expensive
   b. The wire would be too thick
   c. The metal composition may be wrong
   d. The wire is too short

5. When open site working, serious porosity in metal arc welds is brought to your attention. What would you investigate?
   a. Electrode type
   b. Power plant type
   c. Electrode storage
   d. Day temperature

6. The steel composition in a structural contract is changed from 0.15% carbon 0.6% manganese, to 0.2% carbon 1.2% manganese. This might influence the incidence of:
   a. Porosity
   b. Cracking in the weld area
   c. Undercut for fillet welds
   d. Lack of fusion defects

7. One of the following alloys is non-magnetic - which?
   a. 4.0% chromium molybdenum
   b. 12.0% chromium
   c. Austenitic stainless steel
   d. 9.0% nickel steel

8. When TIG welding austenitic stainless steel pipe, argon gas backing is called for.

This is to:
a. Prevent oxidation
b. Prevent underbead cracking
c. Prevent porosity
d. Control the penetration bead shape

9. Pre-heating a carbon steel manual metal arc welding is carried out to minimise the risk of:
a. Scattered porosity
b. Worm hole porosity
c. Parent metal cracking
d. Lack of penetration

10. In UK practice, BS499 specifies that the drawing dimension quoted for a fillet weld is the:
a. Leg length
b. Throat thickness
c. Weld width
d. Actual throat thickness

11. For open site manual metal welding the following equipment is available. Which would you choose for safe site working?
a. Single operator transformer
b. Multi operator transformers
c. AC/DC composite power unit
d. Diesel engine driven motor generator

12. If submerged arc welding is used to make butt welds, which would you be most critical of?
a. The root gap tolerance
b. The angle of preparation
c. The root face width
d. The gas cut finish

13. During CO2 welding, the arc length is most likely to be affected by:
a. The wire diameter
b. The current return connections
c. The gas flow rate
d. The torch to work angle

14. Preheating for arc welding applies to:
a. Assembly welding only
b. Assembly and tack welding
c. Joints over 25 mm thick only
d. Cruciform welds only

15. Which one of the following statements is correct?
a. Preheating increases hardness
b. Preheating increases cooling
c. Preheating increases dilution
d. Preheating increases shrinkage stress

16. You see a welder using an oxy-acetylene flame with a long feathered inner cone. What would be the effect of this on carbon steel?
    a. The weld would be hard and brittle
    b. The weld could be too soft
    c. There will be no effect on the weld
    d. The weld will have undercut

17. A welder qualification test is to verify:
    a. The skill of the welder
    b. The quality of the materials
    c. The non-destructive test procedures
    d. The manufacturing methods

18. A fabricating procedure calls for fillet welds to be 'blended in' by grinding. This influences:
    a. HAZ. cracking
    b. Fatigue life
    c. Residual stress
    d. Yield strength

19. Bend test specimens have been taken from a 25 mm thick carbon steel butt weld. Which would show lack of inter-run fusion?
    a. Side bend
    b. Root bend
    c. Face bend
    d. Guided bend

20. Lamellar tearing has occurred in a steel fabrication. BEFORE welding could it have been found by:
    a. X-ray examination
    b. Dye penetrant
    c. Ultrasonic examination
    d. It would not have been found by any inspection method

21. You are to oversee the arc welding of some machine fittings and find that they are cadmium plated. Would you:
    a. Permit it to proceed
    b. Permit it to proceed with fume extraction
    c. Stop the operation at once
    d. Advise the welder to drink milk and proceed

22. One of the reasons for excluding hydrogen from the weld metal is to prevent the weld from:
    a. Cracking
    b. Cooling slowly
    c. Cooling quickly
    d. Expanding

23. When a metal regains its original shape when a stress acting upon it is removed, the

metal is said to have:
a. Ductility
b. Plasticity
c. Malleability
d. Elasticity

24. Proof stress is used when non-ferrous metals are undergoing tensile tests to determine the equivalent:
a. Tenacity
b. Elasticity
c. Yield strength
d. Tensile strength

25. To test a component for vibrational loading, a suitable mechanical test would be:
a. Impact
b. Tensile
c. Compressive
d. Fatigue

26. The main reason for pre-heating medium and high carbon steels before cutting by oxy-fuel gas technique is to:
a. Improve the quality of the cut
b. Increase the cutting speed
c. Refine the grain structure
d. Prevent hardening and cracking

27. One purpose of a microscopic examination of a weld is to establish the:
a. Strength of the weld
b. Number of alloying elements
c. Grain size
d. Number of runs used

28. The predominant structure of an hyper-eutectoid steel that has been quenched at above its upper critical point will be:
a. Austenite
b. Martensite
c. Troostite
d. Sorbite

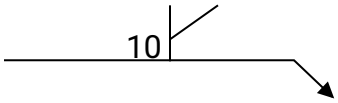
29. When weld metal refinement takes place in a multi-run deposit, it is known by the term:
a. Weld annealing
b. Weld refining
c. Weld normalising
d. Weld recrystallisation

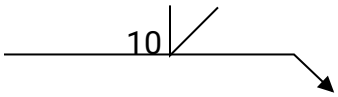
30. One advantage of metal gas arc shielded welding is:
a. Can be used in draughty locations without protection
b. Produces a deposit low in hydrogen content
c. Any welding position can be welded with spray transfer
d. Fine spatter at nozzle restricting gas flow

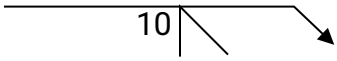
MULTICHOICE PAPER TWO

1. BS499 communicates by the use of symbols the type of joint preparation to be used. Which
of the following symbols indicates the depth of weld penetration required on the joint?

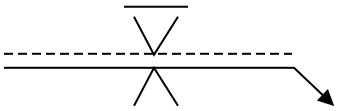
a.

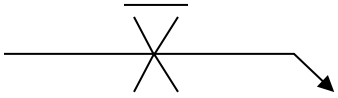
b. 

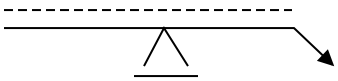
c. 

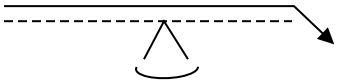
d. 

2. Which of the following symbols would indicate that a weld has to be finished on the 'other' side of the weld?

a. 

b. 

c. 

d. 

3. The use of flux with gas shielded metal arc welding allows:
   a. Sheet metal to be welded
   b. A stable arc when using high current densities
   c. Aluminium to be welded
   d. Less dilution of the weld by the parent metal

4. In MMA welding what parameter is used for control of penetration into the base material?
   a. Voltage
   b. Welding speed
   c. Iron powders in the coating
   d. Current

5. In the welding of a butt joint from one side, the profile of the root bead is controlled by:

a. Root face
b. Bevel angle
c. Root gap
d. All of the above

6. What type of power characteristic is required for manual welding?
a. Constant voltage
b. Flat characteristic
c. Drooping characteristic
d. DC generator

7. Which of the following tests would indicate the toughness of weld metal/parent metal - HAZ?
a. Macro
b. Nick break
c. Hardness
d. Charpy vee notch

8. Degreasing components is essential for quality welding but some agents may:
a. Cause corrosion problems
b. Give off phosgene gas
c. Leave residues
d. All the above

9. Which of the following elements has the greater effect on the hardenability of a steel plate?
a. Molybdenum
b. Chromium
c. Titanium
d. Carbon

10. In MAG/CO2 welding which parameter gives the greatest control of weld appearance during dip transfer or short-circuiting welding?
a. Wire stick-out length
b. Amperage
c. Wire feed speed
d. Inductance

11. In MMA welding, the slags produced can be varied to suit the welding position. Which type of slag would be required for welding in the HV position?
a. Fluid
b. Viscous
c. Semi fluid
d. None of the above

12. The weld metal deposit of MMA electrodes achieves its mechanical strength through:
a. The core wire
b. The flux coating
c. Iron powders with the flux coating
d. None of the above

13. What constituent is needed in the coating of an electrode to prevent the formation of porosity in the welding of a rimming steel?
    a. Iron powders
    b. Calcium fluoride
    c. Silicon
    d. Calcium carbonate

14. Welds made with high heat inputs show a reduction in which of the following properties?
    a. Ductility
    b. Toughness
    c. Fatigue strength
    d. Mechanical strength

15. In the welding of austenitic pipework the bore is usually purged with argon to:
    a. Prevent formation of porosity in the weld
    b. Prevent burn-through in the root run
    c. Prevent oxidation of the root bead
    d. Eliminate the formation of hydrogen

16. In X-ray work the quality of the radiographic image is assessed by the:
    a. Density of the film
    b. IQI indicator
    c. KVA available
    d. Stand-off distance

17. A steel described as QT will have improved tensile properties because it has:
    a. Had control of chemical composition
    b. Been heat-treated
    c. Been quality tested
    d. Been vacuum melted

18. Which one of the following types of steel would give rise to the formation of porosity when autogenously welded with an arc process?
    a. Fully killed steel
    b. Semi killed steel
    c. Rimming steel
    d. Fine grained steel

19. In submerged arc welding the use of excessively high voltage would result in:
    a. Insufficient flux melting
    b. Excessive flux melting
    c. Slag removal difficulties
    d. Spatter

20. Cellulosic electrodes are often used when welding the root pass of pipes in the field

because:
a. Hydrogen control is needed
b. There are iron powders in the electrode
c. Higher arc voltage can be obtained
d. Shorter arc length can be obtained

21. In the welding of austenitic stainless steels, the electrode and plate material can be purchased with low carbon contents. The reason for this is to prevent:
a. Cracking in the heat affected zone
b. The formation of chromium carbides
c. Cracking in the weld metal
d. Distortion

22. Submerged arc fluxes can be supplied in two forms. These are:
a. Sintered and agitated
b. Agitated and fused
c. Sintered and agglomerated
d. Fused and agglomerated

23. In a steel that has improved creep properties at elevated temperatures, which one of the following elements helps in this improvement?
a. Tungsten
b. Manganese
c. Molybdenum
d. Carbon

24. Welding a steel plate with a CE of 0.45 would require preheating to:
a. Prevent the formation of sulphides
b. Prevent hardening in the HAZ
c. Prevent the formation of carbides
d. To improve mechanical properties in the weld

25. Which of the following processes uses the 'keyholing' system of fusion?
a. Friction welding
b. Diffusion bonding
c. Electron beam welding
d. Autogenous TIG welding

26. In friction welding the metal at the interface is in the:
a. Liquid state
b. Solid state
c. Plastic state
d. Elastic state

27. Welding procedures may require welds to be deposited at a controlled rate of heat

input. High heat inputs would:
a. Have poor profile
b. Have larger grain size
c. Have high hardness in the HAZ
d. Have low elongation properties

28. In a tensile test a brittle material would be indicated if the fracture surface:
a. Shows a reduction in size
b. Is flat and featureless
c. Breaks in the parent material
d. Breaks at 45° to the load

29. What destructive test would be required to ascertain the likelihood of cracking in the heat affected zone of a weld?
a. Nick break
b. Side bend test
c. Charpy impact test
d. Macro test

30. In submerged arc welding excessive arc voltage may cause:
a. Excessive penetration
b. Change in weld metal composition
c. Narrow weld width
d. Excessive bead profile

1. The British code for visual inspection requirements is:
   a. BS 4872
   b. BS 499
   c. BS 4870
   d. None of the above

2. A code of practice for visual inspection should include the following:
   a. Before, during and after welding activities
   b. Before welding activities only
   c. After welding activities only
   d. None of the above

3. Incomplete root penetration in a butt joint could be caused by:
   a. Excessive root face width
   b. Excessive root gap size
   c. Low current setting
   d. Both A and C

4. Incomplete root fusion would certainly be caused by:
   a. Linear misalignment
   b. Incorrect tilt angle
   c. Differing root face widths
   d. All of the above

5. When visually inspecting a completed single vee butt weld cap, you would certainly assess:
   a. Cap height
   b. Toe blend
   c. Weld width
   d. All the above

6. You notice a very 'veed' ripple shape. This is most likely caused by:
   a. Poor consumable choice
   b. Welding position
   c. Excessive travel speed
   d. All the above

7. Toe blending is important as it may affect:
   a. Corrosion
   b. Fatigue life
   c. Overlap type defects
   d. All the above

8. Slag inclusions would occur with:
   a. Manual metal arc
   b. Metal inert gas
   c. Submerged arc welding
   d. Both A and C

9. Undercut is principally caused by:
   a. Excessive amps
   b. Excessive volts
   c. Excessive travel speed
   d. All the above

10. Undercut is normally assessed by:
   a. Its depth
   b. Its length
   c. It's blending
   d. All the above

11. A welding procedure is useful to:
   a. Give information to the welder
   b. Give information to the inspector
   c. Give confidence to a product
   d. All the above

12. An essential variable may:
   a. Change the properties of a weld
   b. Influence the visual acceptability
   c. Require re-approval of a weld procedure
   d. All the above

13. A magnifying glass may be used during visual inspection, but BS 5289 states that its magnification should be:
   a. Up to 5 ∅
   b. 2 to 2.5 ∅
   c. 5 to 10 ∅
   d. None of the above

14. When visually inspecting a fillet weld it would normally be sized by:
   a. The leg lengths
   b. The actual throat thickness
   c. The design throat thickness
   d. Both A and C

15. A planar defect is:
   a. Incomplete fusion defects
   b. Slag inclusion
   c. Incomplete penetration
   d. Both A and C

16. Penetrant inspection and magnetic particle inspection are mainly used:
   a. To aid visual inspection
   b. Because the application says so
   c. To confirm visual uncertainties
   d. All the above

17. Defects outside the limits specified in a standard should always be:

a. Repaired
b. Reported to 'a senior person'
c. Assessed along with other defects
d. All the above

18. MIG welding tends to be susceptible to lack of fusion problems. This is because of:
a. Poor maintenance of equipment
b. Incorrect settings
c. Poor inter-run cleaning
d. All the above

19. MMA electrodes can be grouped into three main types. These are:
a. Basic, cellulosic and rutile
b. Neutral, cellulosic and rutile
c. Basic, cellulosic and neutral
d. None of the above

20. The main cause of porosity in welded joints is:
a. Poor access
b. Loss of gas shield
c. 'Dirty' materials
d. All the above

21. Cracks in welds may be due to:
a. Solidification problems
b. Hydrogen problems
c. Excessive stresses
d. All the above

22. A weave technique may give rise to:
a. Better profiles
b. Improved toe blending
c. Improved ripple shape
d. All the above

23. With reference to a root penetration bead you would certainly assess:
a. Root fusion and penetration
b. Root concavity
c. Burnthrough
d. All the above

24. In a fatigue failure the appearance of the fracture surface is characteristic. It would be:
a. Rough and torn
b. 'Chevron'-like
c. Smooth
d. None of the above

25. Stray arcing may be regarded as a serious defect because:
a. It may reduce the thickness dimension of a component

b. It may cause loquation cracks
c. It may cause hard zones
d. All the above

26. Overlap in welds could be influenced by:
a. Poor welding technique
b. Welding process
c. Welding position
d. All the above

27. Flame cut preparations may, during welding, increase the likelihood of:
a. Cracking
b. Misalignment problems
c. Inclusions
d. All the above

28. Macroscopic examination requires any specimen to be inspected:
a. Once, after etching
b. Twice, before and after etching
c. Using a microscope
d. None of the above

29. Which of the following may be classed as a more serious defect:
a. Slag inclusions
b. Fusion defects (inter-run)
c. Fusion defects (surface)
d. Porosity

30. A code of practice is:
a. A standard for workmanship only
b. A set of rules for manufacturing a specific product
c. Levels of acceptability of a weldment
d. None of the above

MULTICHOICE PAPER FOUR

1. Movement of the arc in MMA welding by magnetic forces is called:
a. Arc deviation
b. Arc misalignment
c. Arc blow

d. Arc eye

2. A metallurgical problem most associated with submerged arc welding is:
   a. Hydrogen cracking in the HAZ
   b. Solidification cracking in the weld metal
   c. Hydrogen cracking in the weld metal
   d. Lamellar tearing in the weld metal

3. Oxy pressure and nozzle size in flame cutting would influence:
   a. The temperature required for cut initiation
   b. The ability to cut stainless steels
   c. The depth of the cut obtainable
   d. None of the above

4. The main usage of arc cutting/gouging processes is:
   a. The cutting of single bevel preparations
   b. The removal of deposited welds
   c. The cutting of single U type preparations
   d. The cutting/gouging of non-ferrous materials only

5. Which of the following processes joins metals plastically?
   a. Friction welding
   b. Resistance welding
   c. Plasma welding
   d. All the above

6. Which electrode classification would be relevant to AWS A5.1-81?
   a. E 6013
   b. E 5133
   c. E 7018 - G
   d. Fleetweld 5

7. Which of the following coatings is associated with stove welding?
   a. Rutile
   b. Cellulosic
   c. Basic
   d. Oxidising

8. A common gas mixture used in MIG welding nickel alloys, to combine good levels of penetration with good arc stability would be:
   a. 100% CO2
   b. 100% argon
   c. 80% argon and 20% CO2
   d. 98% argon and 2% oxygen

9. Which type of SAW flux is more resistant to moisture absorption?
   a. Fused
   b. Agglomerated
   c. Basic
   d. All the above have the same resistance

10. The flame temperature of oxy/acetylene mixture gas is given as:
    a. 3200°C
    b. 2300°C
    c. 5000°C
    d. None of the above

11. A large grain structure in steels is said to produce:
    a. Low ductility values
    b. Low fracture toughness values
    c. High fracture value values
    d. High tensile strength

12. The likelihood of brittle fracture in steels will increase with:
    a. A large grain formation
    b. A reduction of in-service temperature to sub zero temperatures
    c. Ferritic rather than austenitic steels
    d. All the above

13. Repair welding is often more difficult than production welding due to:
    a. The material being ingrained with in-service contaminants
    b. Restricted access within the repair area
    c. The possible position of the weld repair
    d. All the above

14. Hydrogen cracking in the weld metal is likely when welding:
    a. Carbon manganese steels
    b. Stainless steels
    c. Micro alloyed steels (HSLA)
    d. Low carbon steels

15. EN 288 standard would refer to which of the following:
    a. Welder approval testing
    b. Welding equipment
    c. Welding procedure approval
    d. Consumables for welding

16. Porosity is caused by:
    a. Entrapped slag in the solidifying weld
    b. Entrapped gas in the solidifying weld
    c. Entrapped metallic inclusions in the solidifying weld
    d. None of the above

17. In a bend test the face of the specimen is in tension and the root is in compression. What type of test is being carried out?
    a. A root bend test
    b. A side bend test
    c. A face bend test
    d. None of the above

18. Ultrasonic testing is more advantageous in detecting which of the following weld imperfections, over other NDT methods?
    a. Lack of sidewall fusion

b. Surface undercut
c. Incompletely filled groove
d. Overlap

19. Tempering is often carried out to regain toughness after which of the following processes?
a. Annealing
b. Normalising
c. Hardening
d. Stress relieving

20. The presence of iron sulphide in the weld metal is most likely to produce which of the following upon contraction of the weld?
a. Solidification cracking
b. Hydrogen cracking
c. Intergranular corrosion
d. Stress corrosion cracking

21. Austenitic stainless steel electrodes are generally smaller in length than mild steel electrodes because:
a. High amperage is used
b. Shelf life will be decreased
c. Their electrical conductivity is less than that of steel
d. They are more expensive

22. The voltage necessary to maintain an arc during metal arc welding is termed:
a. Mains supply voltage
b. Arc current
c. Arc voltage
d. Open circuit voltage

23. When MMA welding low carbon steel which electrode will give the greatest deposition rate?
a. Hydrogen controlled
b. Cellulosic
c. Rutile
d. Iron powder

24. Inherent rectification of the electrical output is produced in the arc when TIG welding using:
a. AC with a suppressor
b. AC without a suppressor
c. DC with reverse polarity
d. DC with straight polarity

25. Gamma rays and X-rays are part of a family of waves called:
a. Acoustic waves
b. Light waves

c. Electromagnetic waves
d. Transverse waves

26. A measure of the accuracy of a radiograph as an NDT tool is given by its:
a. Intensity
b. Density
c. Sensitivity
d. Exposure

27. A surface breaking crack will be detected during a magnetic particle inspection if it is:
a. At right angles to the lines of flux
b. Parallel to the lines of flux
c. At 25° to the lines of flux
d. All the above

28. The advantage of ultrasonic non-destructive testing for the examination of weldments is:
a. It can be used to locate flaws
b. It can be used to size flaws
c. It has a high sensitivity to planar flaws
d. All the above

29. Under normal contract conditions weld procedure approval tests for pipework are:
a. Mandatory
b. Dependant on site and weather conditions
c. Dependant upon the contractor's confidence in his procedures
d. Only required when MMA welding is used

30. Hydrogen controlled electrodes were developed principally for:
a. The prevention of porosity
b. The prevention of cracking
c. The enhancement of arc voltage
d. Their ease of arc starting

MULTICHOICE PAPER FIVE

1. Generally the most suitable method of detecting lack of sidewall fusion would be:
a. Ultrasonics.
b. MPI.
c. Radiography.
d. Penetrant inspection.

2. Hot shortness is a term used to indicate:
a. Lamellar tearing.
b. Solidification cracking.
c. Hydrogen cracking.
d. None of the above.

3. Cobalt as an isotope would generally be used on:

a. Thin material.
b. Tee joints.
c. Plate thicknesses greater than 25 mm.
d. All the above.

4. In welding procedure terms, a change in essential variable means:
a. Re-qualification of the weld procedure.
b. Possible changes in the weld's microstructure.
c. Possible changes in the mechanical properties.
d. All the above.

5. Weld symbols placed on a dotted line in accordance with ISO requirements means:
a. Weld on 'arrow' side.
b. Weld on 'other' side.
c. Weld on site.
d. Full penetration required.

6. A welding inspector's main attributes include:
a. Knowledge and experience.
b. Literacy.
c. Honesty and integrity.
d. All the above.

7. Technically, a code of practice is:
a. A standard.
b. A 'set of rules' for the manufacture of a product.
c. Related to welder and weld procedure approval.
d. All the above.

8. The correct term for 'cap height' is:
a. Reinforcement.
b. Cap profile height.
c. Excess weld metal.
d. All the above.

9. A tensile test will assess:
a. Impact values.
b. Stress.
c. Strain.
d. Both b and c.

10. The important point of high temperature steels is that:
a. They can withstand creep failure.
b. They may suffer re-heat cracking problems.
c. They may suffer loss of toughness.
d. All the above.

11. An austenitic stainless steel may suffer:
a. Weld decay.
b. Sensitisation.
c. Solidification cracking.
d. All the above.

12. Carbon equivalent values are useful to determine:
    a. Weldability aspects.
    b. Crack sensitivity aspects.
    c. Typical mechanical properties.
    d. All the above.

13. A basic electrode would normally:
    a. Have superior mechanical properties.
    b. Require baking before use.
    c. Not be used on low carbon steels.
    d. Both a and b.

14. When referring to TIG welding, the shielding gas could be:
    a. Argon and hydrogen.
    b. Argon and helium.
    c. Argon and nitrogen.
    d. All the above.

15. When referring to MIG welding, the shielding gas would be:
    a. Argon.
    b. Argon + 1% oxygen.
    c. Argon + 20% carbon dioxide.
    d. None of the above.

16. Submerged arc utilises:
    a. Deep penetration characteristic.
    b. High deposition rates on DC+.
    c. Flat (PA) welding only.
    d. None of the above.

17. Ultrasonics would be preferred over radiography due to:
    a. Ability to find most defects.
    b. Lower skill requirement.
    c. Ability to detect laminations.
    d. Both a and c.

18. The most serious defect types are:
    a. Planar.
    b. Cracks.
    c. Lack of fusion.
    d. All the above.

19. MMA welding of low alloy steels is more likely to be performed with:
    a. Rutile electrodes.
    b. Cellulosic electrodes.
    c. Iron powder electrodes.
    d. Basic hydrogen controlled electrodes.

20. Which of the following defects is more common to welds deposited by CO2 welding

than welds deposited by MMA?
a. Slag inclusions.
b. Excess penetration.
c. Lack of sidewall fusion.
d. Tungsten inclusions.

21. Which defect would you expect to get in TIG welds in non-deoxidised steel?
a. Undercut.
b. Porosity.
c. Tungsten inclusions.
d. Linear misalignment.

22. Which of the following can arise from copper inclusions in a ferritic steel weld?
a. Weld metal cracks.
b. HAZ cracks.
c. Lamellar tearing.
d. Porosity.

23. Which of the following is likely to give the highest impact strength in ferritic weld metal?
a. Cellulosic electrodes.
b. Submerged arc with acid flux.
c. Spray transfer CO2 welding.
d. Basic coated MMA electrodes.

24. You suspect that ferritic steel plates contain cracks in the prepared edges. What NDT method would you use to check this?
a. Radiography.
b. Magnetic particle inspection.
c. Penetrant inspection.
d. Ultrasonic flaw detection.

25. Which of the following defects would you not expect to find by visual inspection of welds?
a. Linear slag inclusions.
b. Undercut.
c. Overlap.
d. Linear misalignment.

26. Stress relieving is not helpful in which of the following cases?
a. Improving resistance to stress corrosion cracking.
b. Improving dimensional stability after machining.
c. Lowering the peak residual stress.
d. Softening the steel.

27. What is the maximum hardness usually recommended for the heat-affected zone of a medium strength ferritic steel weld?
a. 100 DP Hv.
b. 350 DP Hv.
c. 500 DP Hv.
d. 750 DP Hv.

28. What effect does mid thickness laminations in steel plate normally have when they are located within a weld heat affected zone?
    a. Cause lamellar tearing.
    b. Fuse together to form a bond.
    c. Affect the weld metal composition.
    d. Cause internal tearing on a micro scale.

29. The permanent backing material for MMA welding of low carbon steel should be made from:
    a. Copper.
    b. Low carbon steel.
    c. QT steel.
    d. Cast iron.

30. The overall length of a pipeline can be affected by:
    a. Transverse shrinkage.
    b. Longitudinal shrinkage.
    c. Angular shrinkage.
    d. Circumferential shrinkage.

MULTICHOICE PAPER SIX

1. The weld dimension used to indicate the minimum strength of a fillet weld is:
    a. Leg length.
    b. Throat thickness.
    c. Width of bead.
    d. Length of weld element.

2. An electroslag weld requires what heat treatment to improve the grain structure?
    a. Annealing.
    b. Stress relieving.
    c. Normalising.
    d. Quench and tempering.

3. The most common type of failure associated with sharp fillets, notches and undercut is:
    a. Crystallisation.
    b. Fatigue.
    c. Corrosion.
    d. Brittle fracture.

4. Weld decay in stainless steels can be avoided by:
   a. Stress relieving.
   b. Slow cooling after welding.
   c. Addition of more manganese to the steel.
   d. Addition of titanium to the steel.

5. An eutectoid mixture in steel is:
   a. A mixture of ferrite and austenite.
   b. A mixture comprising a substitutinal solid solution.
   c. Called pearlite.
   d. Called ledeburite.

6. Low alloy steels having a high carbon equivalent before welding will require:
   a. A reduction in carbon content.
   b. High pre-heat temperatures.
   c. Low pre-heat temperatures.
   d. No pre-heating.

7. The electrodes for welding low alloy steels should be:
   a. Used with a low current value.
   b. One size larger than for general purpose electrodes.
   c. Used for welding in the flat position only.
   d. Heated in a drying oven before use.

8. The purpose of pre-heating low alloy steel pipes before electric arc welding is to:
   a. Refine grain structure.
   b. Relieve internal stress.
   c. Retard rapid cooling.
   d. Regulate excessive expansion.
9. Welder qualification tests are designed to:
   a. Test the correctness of the welding procedure.
   b. Test the welder's skill.
   c. Prove the weldability of the parent material.
   d. All the above.

10. In positional MMA welding on pipework, welders are having difficulty in obtaining good capping profiles when welding in the overhead position. Would you:
   a. Advise them to increase the current.
   b. Advise them to increase the voltage.
   c. Ask for a new welding team.
   d. Suggest the use of a smaller diameter electrode.

11. You have a macro section of a 'T' butt joint that shows a step-like defect lying outside the visible HAZ. What would this defect possibly signify?
   a. HAZ cracking.
   b. Toe cracking.
   c. Lamination.
   d. Lamellar tearing.

12. Which electrode deposits weld metal with the greatest ductility and resistance to

cracking?
a. Rutile.
b. Cellulosic.
c. Basic.
d. Oxidising.

13. Which one of the following is not helpful in minimising angular distortion during welding?
a. Use of double 'V' weld prep using balanced welding technique.
b. Pre-setting of work piece.
c. Applying post weld heat soak.
d. Changing from a single 'V' prep for thick material.

14. Argon purging on the root side is necessary in the TIG welding of stainless steel to:
a. Obtain full penetration.
b. Obtain full fusion.
c. Avoid porosity in the root.
d. Obtain a satisfactory weld surface finish.

15. Which of the following can arise from copper inclusions in a mild steel weld?
a. Weld metal cracks.
b. HAZ cracks.
c. Lack of fusion.
d. Porosity.

16. Stress relief is not helpful in which of the following cases?
a. In improving resistance to stress corrosion.
b. In improving dimensional stability after machining.
c. In lowering the peak residual stresses.
d. In softening the metal.

17. Stray arc strikes are undesirable since they:
a. Leave a poor surface finish.
b. Cause weld metal cracking.
c. Reduce corrosion resistance.
d. Cause local hardening and cracking in the parent material.

18. Cold cracking is most likely to occur in a weldment if:
a. The rate of cooling is too fast.
b. The rate of cooling is too slow.
c. It lacks ductility at high temperatures.
d. Impurities are present at its grain boundaries.

19. Chromium, when added to steel as an alloying element, has the effect of making the alloy more:
a. Ductile.
b. Plastic.
c. Hardenable.
d. Malleable.

20. When depositing weld metal, fusion will take place at the sides of the joint resulting in an admixture between weld metal and parent metal. This alloying effect is known

as:
a. Diffusion.
b. Absorption.
c. Dilution.
d. Migration.

21. Percentage elongation of a metal undergoing a tensile test is a measure of:
a. Elasticity.
b. Plasticity.
c. Ductility.
d. Malleability.

22. When a longitudinal load is put on a lap joint, the stress set up is normally:
a. Shear stress.
b. Tensile stress.
c. Compressive stress.
d. Residual stress.

23. When a metal is subjected to a fluctuating load, a condition of cyclic stressing can be set up, which eventually can result in structural breakdown known as:
a. Tensile failure.
b. Fatigue failure.
c. Yield failure.
d. Shear failure.

24. What happens to the mechanical properties of steel if the carbon content is increased to 0.5%?
a. The material becomes softer.
b. Malleability is increased.
c. The tensile strength is increased.
d. Ductility is increased.

25. Columnar growth takes place when a metal is:
a. Cold.
b. Losing heat.
c. Being heated.
d. Being rolled.

26. If a low carbon steel pipe has to carry a liquid, care must be taken when making the butt welds to ensure penetration is not excessive because it:
a. Reduces the flow rate of the liquid.
b. May increase the rate of corrosion.
c. Can contaminate the liquid.
d. May cause excessive pipe wear.

27. When a steel suffers hot shortness, it is mostly due to the presence of:
a. Sulphur.
b. Phosphorous.

c. Silicon.
d. Manganese.

28. When a steel is heated to above its upper critical temperature, the structure produced is:
a. Martensite.
b. Austenite.
c. Pearlite.
d. Sorbite.

29. The type of crystal normally found in a single run arc weld in the as welded condition is:
a. Equi-axed.
b. Polycrystalline.
c. Dendritic.
d. Columnar.

30. The first sub-zone in the heat affected zone of the parent metal nearest the weld deposit will consist of:
a. Large crystal grains.
b. Small crystal grains.
c. Elongated crystal grains.
d. Distorted crystal grains.

MULTICHOICE PAPER SEVEN

1. Pipe welding codes are set up by:
a. Welding operators.
b. State governments.
c. Associations, societies, insurance companies, manufacturers and the military.
d. Construction unions.

2. The different grain structure between the weld deposit and the base metal can be determined by:
a. A face bend test.
b. A root bend test.
c. A hardness test.
d. An etching test.

3. A root bend test is used to test the amount of weld:
a. Ductility.
b. Elongation.
c. Hardness.
d. Penetration.

4. What would be observed if a fillet weld were sectioned and macro-etched?

a. The grain of the other beads is coarser than the final bead.
b. The penetration and fusion into the root is very deep.
c. Each bead appears to be distinctly separated from the adjoining beads.
d. The grain structure remains the same in all passes.

5. What is the most common cause of failure in root bend tests?
a. Too high a current setting.
b. Too long a pause in the down cycle of the weave.
c. Lack of fusion and penetration.
d. Too high a travel speed.

6. The purpose of a nick break specimen is to provide a test for:
a. Tensile strength and fracture appearance.
b. Ductility and fracture appearance.
c. Elongation and fracture appearance.
d. Soundness and fracture appearance.

7. Which organisation publishes the most commonly used code for boiler and pressure vessel welding?
a. American Welding Society.
b. American Society of Mechanical Engineers.
c. American Petroleum Institute.
d. American National Standards Institute.

8. A low hydrogen electrode, according to BS 639, would contain:
a. No hydrogen.
b. Less than 15 ml of hydrogen per 100 grams of deposited weld metal.
c. Between 15 ml and 25 ml of hydrogen per 100 grams of deposited weld metal.
d. Less than 25 ml of hydrogen per 100 grams of deposited weld metal.

9. The second run in a three run butt weld using the stovepipe technique is known as the:
a. Filling run.
b. Hot pass.
c. Intermediate run.
d. Sealing run.

10. You could determine that an electrode is cellulosic by its:
a. BS 639 coding.
b. Colour.
c. Trade name.
d. BS 499 coding.

11. Which type of electrode coating gives the most voluminous gas shield?
a. Rutile.
b. Basic.
c. Oxidising.

d. Cellulosic.

12. Which of the following steels is likely to be more susceptible to hydrogen cracking?
    a. Carbon equivalent of less than 0.25 %.
    b. Carbon equivalent of 0.35%.
    c. Carbon equivalent of 0.38%.
    d. Carbon equivalent of 0.43%.

13. Preheating and interpass heating are used primarily for:
    a. Aiding fusion.
    b. Reducing hydrogen content of weld preparation prior to welding.
    c. Ensure a fine grain size.
    d. Slow down the cooling rate after welding.

14. Submerged arc welds made with re-cycled flux are liable to:
    a. Porosity.
    b. Course grain size.
    c. Undercut.
    d. Incomplete penetration.

15. Incomplete penetration in a single 'V' butt joint could be caused by:
    a. Too large a root gap.
    b. Too small a root gap.
    c. Too high a heat input.
    d. Too small a root face.

16. In submerged arc welding, which of the following width to depth ratios would be likely to result in solidification cracking?
    a. 1 : 3.
    b. 3 : 1.
    c. 2 : 1.
    d. 1 : 1.

17. You are responsible for controlling welding on site. A large incidence of porosity has been reported in recent welding. Would you investigate?
    a. The electrode type.
    b. Power source.
    c. Electrode storage.
    d. Day temperature.

18. The main reason why all adhering scale should be removed when the pipe end preparation is made by oxy-gas cutting is?
    a. Oxidisation of the weld metal is minimised.
    b. The speed of welding is increased.
    c. Pipe bore alignment is made easier.
    d. Reduction of the weld deposit is prevented.

19. When manual metal arc welding low carbon steel, which electrode covering will give the greatest degree of penetration?
    a. Iron powder.

b. Rutile.
c. Cellulosic.
d. Low hydrogen.

20. When tungsten arc gas shielded welding stainless steel, which one of the following should be used?
a. Alternator.
b. A. C. transformer.
c. D. C. generator.
d. Constant potential rectifier.

21. Which gas shroud should be used when tungsten arc gas shielded welding aluminium alloys?
a. Nitrogen.
b. Carbon dioxide.
c. Argon/carbon dioxide mixture.
d. Argon.

22. The most common type of defect found in a structure when it is undergoing service is:
a. Fatigue cracking.
b. Crystallisation.
c. Weld decay.
d. Stress fracture.

23. In the examination of a welded aluminium joint, macro etching may reveal:
a. Lack of inter-run penetration.
b. Carbon pick-up.
c. Weld decay.
d. Micro cracks.

24. MMA welds made with damaged electrode coatings are subject to:
a. Porosity.
b. Undercut.
c. Excessive penetration.
d. Excessive bead height.

25. Which physical test is more likely to reveal HAZ embrittlement?
a. Transverse tensile.
b. All weld tensile.
c. Root bend.
d. Charpy impact.

26. Which of the following destructive tests is not normally required for welder approval?
a. Bend tests.
b. Macro examination.
c. Impact tests.
d. Fracture tests.

27. Too large a diameter of filler rod should not be used to make a welded joint because:
    a. Excess reinforcement profile will be difficult to obtain.
    b. The included bevel angle will have to be reduced.
    c. Root fusion may be difficult to obtain.
    d. The gap setting will have to be changed.

28. If pipe bores are not matched correctly it can result in:
    a. Lack of root penetration.
    b. Incorrect gap setting.
    c. Excessive root faces.
    d. Overheating during welding.

29. A correctly made tack weld should slope from the middle to the ends in order to:
    a. Aid better penetration at the join-up.
    b. Prevent porosity at the join-up.
    c. Reduce the electrode size required.
    d. Reduce the overall consumable consumption.

30. Two low carbon steel pipes, 150mm diameter and 6mm wall thickness, are to be butt welded using the TIG process. To ensure a full strength joint, which of the following preps is most suitable?
    a. Open single bevel.
    b. Open single Vee.
    c. Open square preparation.
    d. Closed square preparation.

PROPERTIES OF MATERIALS

1. The ability of a material to withstand a load pulling it apart is called its _____ _____.

2. The ability of a material to be stretched out without breaking is called _____.

3. An Izod impact machine is used to give indication of the _____ of a material.

4. The ability to withstand indentation is called _____.

5. Lack of ductility is called _____.

6. The property of a metal to return to its original shape is called _____.

7. Increase in carbon content causes an _____ in strength and hardness.

8. When carbon percentage increases, there is a decrease in _____.

9. Low carbon steel contains less than _____ carbon.

10. Low ductility in a weld metal could result in _____.

11. Alloying is used to _____ mechanical and physical properties of a steel.

12. Sulphur and phosphorus are not alloying elements; they are _____.

13. Alloying allows designers to use _____ sections and still have the same strength.

14. An alloy that contains a high percentage of chromium and nickel would have resistance to _____.

15. Quenching a carbon or low alloy steel will result in an _____ in hardness and a _____ in ductility.

16. The hard constituent that results when steel is quenched is called _____.

17. The tough laminated structure that is formed on slow cooling of ferrite and iron carbide (cementite) is called _____.

18. The amount of martensite formed depends on the speed of _____ and the percentage of _____.

19. After quenching, the structure may be improved by reheating to 200-300°C. This is called _____.

20. Small percentages of chromium will increase the strength and _____, while a small percentage of nickel will increase _____.

ANSWERS

PAPER ONE

1. d	2. d	3. b	4. c	5. c
	6. b	7. c		
8. a	9. c	10. a	11. d	12. a
	13. b	14. b		
15. c	16. a	17. a	18. b	19. a
	20. d	21. c		
22. a	23. d	24. c	25. d	26. d
	27. c	28. b		
29. b	30. b			

PAPER TWO

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

		20.	c	21.	b				
22.	d	23.	c	24.	b	25.	c	26.	c
		27.	b	28.	b				
29.	d	30.	b						

PAPER THREE

1.	d	2.	a	3.	d	4.	d	5.	d
		6.	c	7.	b				
8.	d	9.	d	10.	d	11.	d	12.	d
		13.	b	14.	d				
15.	d	16.	d	17.	b	18.	d	19.	a
		20.	d	21.	d				
22.	d	23.	d	24.	c	25.	d	26.	d
		27.	d	28.	b				
29.	c	30.	b						

PAPER FOUR

1.	c	2.	b	3.	c	4.	b	5.	a
		6.	a	7.	b				
8.	b	9.	a	10.	a	11.	b	12.	d
		13.	d	14.	c				
15.	c	16.	b	17.	c	18.	a	19.	c
		20.	a	21.	c				
22.	c	23.	d	24.	b	25.	c	26.	c
		27.	a	28.	d				
29.	a	30.	b						

PAPER FIVE

1.	a	2.	b	3.	c	4.	d	5.	b
		6.	d	7.	b				
8.	c	9.	d	10.	d	11.	d	12.	d
		13.	d	14.	d				
15.	a	16.	a	17.	d	18.	d	19.	d
		20.	c	21.	b				
22.	a	23.	b	24.	b	25.	a	26.	b
		27.	b						
28.	a	29.	b	30.	b				

PAPER SIX

1. b	2. c	3. b	4. d	5. c
	6. b	7. d		
8. c	9. b	10. d	11. d	12. c
	13. c	14. c		
15. a	16. b	17. d	18. a	19. c
	20. c	21. c		
22. a	23. b	24. c	25. b	26. a
	27. a	28. b		
29. d	30. a			

PAPER SEVEN

1. c	2. d	3. a	4. c	5. c
	6. d	7. b		
8. b	9. b	10. a	11. d	12. d
	13. b	14. a		
15. b	16. a	17. c	18. a	19. c
	20. c	21. d		
22. a	23. a	24. a	25. d	26. c
	27. c	28. a		
29. a	30. b			

PROPERTIES OF MATERIALS

1. Tensile Strength.	2. Ductility.	3. Toughness.	4. Hardness.
5.Brittleness.	6. Elasticity.	7. Increase.	8. Ductility.
9.0.2%	10. Cracking.	11. Increase.	12. Impurities.
13. Smaller/Thinner.	14. Corrosion.	15.Increase....Decrease	
16.Martensite.	17.Pearlite.	18. Cooling....Carbon.	
19.Tempering.	20. Hardness....Toughness.		