

JUNIOR WORKSHOP

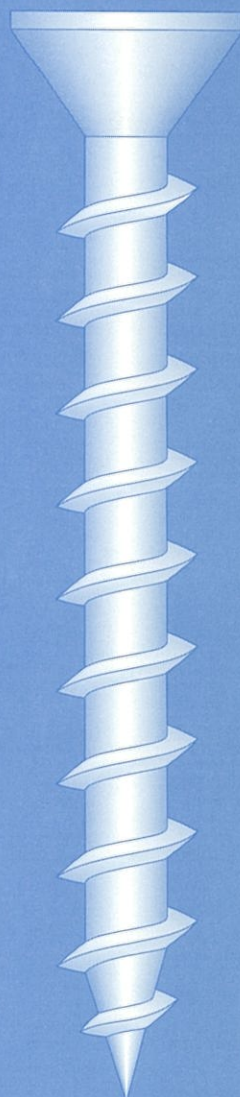
WORKBOOK

2

Third Edition

D.Schlyder

A



JUNIOR WORKSHOP A - Workbook 2

Third Edition - D.Schlyder

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HEALTH AND SAFETY

1. List two safety requirements that relate to machine guards.

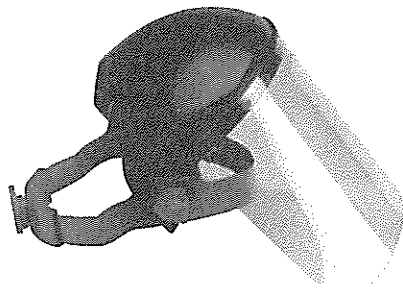
a. _____

b. _____

2. Give an example of how injury could result from 'horseplay' in the workshop.

3. Name the personal protective device shown on the right and give an example of a situation in the workshop where the device must be worn.

Briefly explain why this device should be worn in preference to other protective devices.



Name: _____

4. Where would a dangerous goods sign such as the one shown on the right be located in a workshop?



5. List the three ingredients that must be present before a fire can start.

a. _____ b. _____ c. _____

6. What is the first priority of emergency and evacuation procedures?

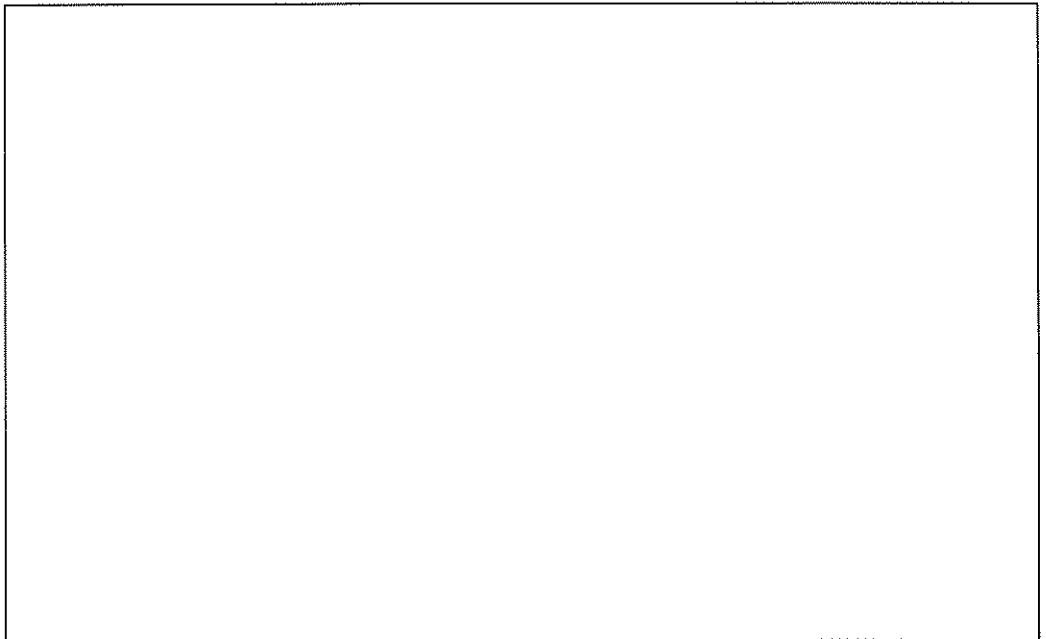
7. Which of the following best describes how dangerous chemicals can enter the body?

- a. Breathed in and absorbed through the lungs.
- b. Swallowed and absorbed through the stomach.
- c. Absorbed directly through the skin.
- d. All of the above.

GROWTH AND STRUCTURE OF TREES

1. Describe two functions of the root system of a tree.
 - a. _____
 - b. _____
2. Which major part of a tree provides rigid support and carries water and food to the crown?

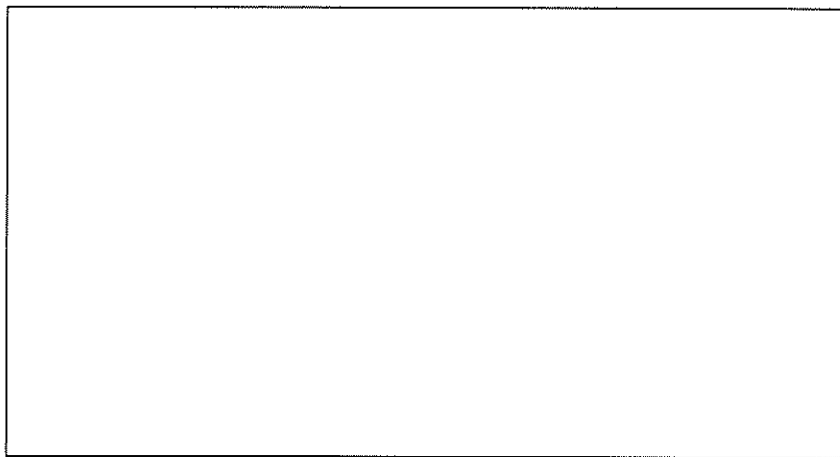
3. In the space provided below draw a neat sketch to represent the section of a tree which shows the root system and the bark, sapwood and truewood zones. Use appropriate colours for the different zones including the foliage of the tree. Do NOT use felt pens. Clearly name all major parts of the tree.



4. Leaves produce food for the tree by a process called:
 - a. photoanalysis.
 - b. synthetic analysis.
 - c. photosynthesis.
 - d. synthetic conversion.
5. What is produced and released to the air in the food making process?

6. Name the green colouring which must be present in the food making process.

7. Food material produced in the leaves is conducted to the branches, trunk and roots through the:
- a. live bark.
 - b. sapwood.
 - c. cambium layer.
 - d. dead bark.
8. Water and mineral salts are conducted from the roots to other parts of the tree through the:
- a. medullary rays.
 - b. live bark.
 - c. pith.
 - d. sapwood.
9. In the space provided below draw the section of a nine year old tree showing and naming the growth rings, medullary rays, pith and dead bark.



10. Which of the following does not apply to the cambium layer?
- a. It is responsible for all growth in trunk thickness.
 - b. It builds bark cells on the outside of the layer.
 - c. It is a thick layer of cells clearly visible below the live bark.
 - d. It builds wood cells on the inside of the layer.
11. Which of the following does not apply to the truewood (or heartwood) zone of a tree?
- a. It is comprised of living cells.
 - b. It provides the strength necessary to support the tree.
 - c. It is formed by blockage of the channels which conduct food materials.
 - d. It is much more durable than sapwood.
12. If a nail was driven into the trunk of a healthy growing tree:
- a. it would always remain the same height above the ground.
 - b. its height above the ground would increase with the growth of the tree.
 - c. it would always remain visible as the girth of the tree increased.
 - d. it would be gradually ejected from the trunk of the tree.

WOOD – CLASSIFICATION, PROPERTIES AND CONVERSION

1. A botanist would apply the term _____ to wood that contains large pores in its structure.
2. Which of the following does not apply to conifers?
 - a. They are softwoods.
 - b. They have needle-like foliage.
 - c. They are broad leafed trees.
 - d. They are cone-bearing trees.

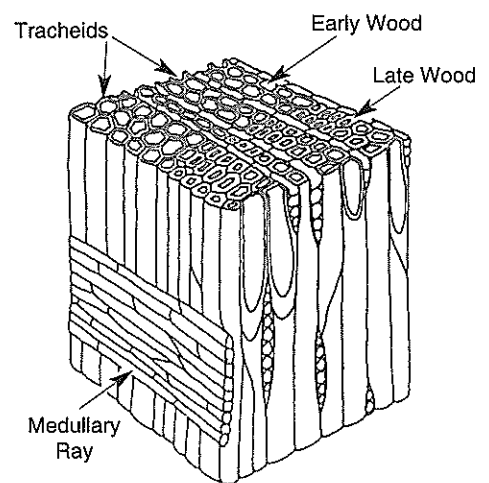
3. Balsa would be classified by a botanist as a softwood.

a. True b. False

4. The diagram on the right illustrates the cellular structure of:

a. Hardwood. b. Softwood.

5. What are the medullary rays and what is their purpose?



6. What are the 'tracheids' illustrated in the diagram above?

7. Darker coloured growth rings in the end grain of wood are formed by:

a. early wood b. late wood

8. Briefly explain the reason for your answer to question 7 above.

9. Which of the following does not necessarily refer to the strength of wood?

- a. It is directly related to the cellular structure.
- b. It is always directly related to the weight.
- c. The length of wood fibres is an important factor.
- d. It is increased when the timber is seasoned.

10. Briefly define the term 'durability' when it is applied to wood.

11. Which property of wood refers to the arrangement and relative size of cells?

12. What is the meaning of the term 'figure' as it applies to the appearance of wood?

13. Grain refers to the general direction of fibres in a piece of timber. Briefly describe each of the grain types listed below.

a. Cross Grain:

b. Straight Grain:

c. Interlocked Grain:

14. Why are logs usually sawn into commercial sizes soon after felling?

15. State two advantages and two disadvantages of live sawing.

Advantages.

Disadvantages.

16. In the space provided on the right draw a diagram illustrating a live sawn log. Show growth rings and medullary rays.

17. Boards whose faces are generally tangential to the growth rings are _____
sawn boards.

18. Briefly explain why fancy timbers with distinct growth rings are often back sawn.

19. Which of the following does not apply to back sawing or back sawn boards?

- a. Boards have maximum strength.
- b. These boards tend to shrink mostly in the width.
- c. A little cupping away from the heart may occur as the boards are drying.
- d. This method does not allow for sawing around defects in the log.

20. Trade practice in the timber industry is to class boards as back cut when _____

21. The rectangle on the right represents the end of a quarter sawn board. Complete the sketch by showing growth rings and medullary rays.



22. Timbers which reveal a distinctively patterned figure when quarter sawn have pronounced _____

23. Which of the following applies to quarter sawing or quarter sawn boards?

- a. This method is most economical as little timber is lost in waste.
- b. These boards do not season very well.
- c. Minimal cupping and little shrinkage occurs when quarter sawn boards are seasoned.
- d. Boards are classed as quarter cut when the growth rings have an average angle of less than 45° to the face of the board.

TIMBER GRADING AND DEFECTS

1. Timber is graded into categories according to _____

2. List some of the factors which determine the grade for a piece of timber.

3. Name the organisation which issues statements of the qualities of the various grades of milled timber.

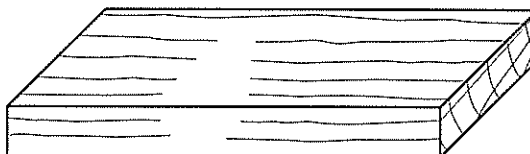
4. Why are the specifications of Australian timber standards revised from time to time?

5. Briefly describe how knots are formed in timber.

6. Knots do not tend to weaken timber.
a. True b. False

7. What characteristic of knots in milled timber sometimes causes difficulties in working the timber?

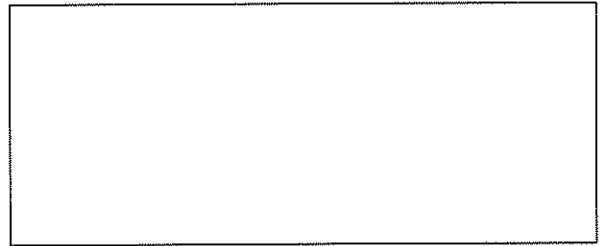
8. The diagram on the right represents a piece of milled timber. Draw a 'spike' knot in the face of the board.



9. Briefly describe the possible cause of a 'shake' occurring while a tree is still standing.

10. In the space provided on the right draw a neat sketch of a piece of timber containing a 'shake' or separation between growth rings.

Show growth rings, medullary rays and figure in your sketch.



11. Which of the following does not apply to the natural defect which is called a 'gum vein'?
- a. They tend to weaken the timber.
 - b. They are always caused by an injury to the tree.
 - c. They are cavities in the wood which contain resin substances.
 - d. They usually disfigure the timber.

12. Which of the following applies to the natural defect which is called a 'pipe'?
- a. Pipes form when wood around the cambium layer decays.
 - b. Pipes form when wood around the pith decays.
 - c. A pipe is formed when a shake rots away.
 - d. A pipe is formed when a knot rots away.

13. Apart from natural defects which tend to weaken timber, what other factors determine mechanical strength?

14. Briefly explain why it is important to know the mechanical strength of the grades and species of timber used in the building industry.

15. Published grading rules cover most species of timber which are available commercially in Australia. They describe two broad classifications or grades. Name the two grades.

a. _____ b. _____

SEASONING AND PRESERVATION OF TIMBER

1. Which of the following best describes the process of seasoning timber?
 - a. Drying out all the water from the cell walls and cell cavities.
 - b. Drying out most of the water from the cell walls and cell cavities.
 - c. Impregnating the timber with chemicals.
 - d. Removing the resins and lignin from the cell structure.

2. Which of the following does not apply to the green moisture content of timber?
 - a. It varies considerably in different species of timber.
 - b. It is the colour of the water in the cell walls and cavities.
 - c. It is the free moisture plus the combined moisture.
 - d. It varies considerably in the different zones of the tree.

3. Water is contained in the cell walls as _____ moisture and in the cell cavities as _____ moisture.

4. Briefly explain the term 'fibre saturation point'.

5. At what stage of the seasoning process does a considerable amount of shrinkage take place?

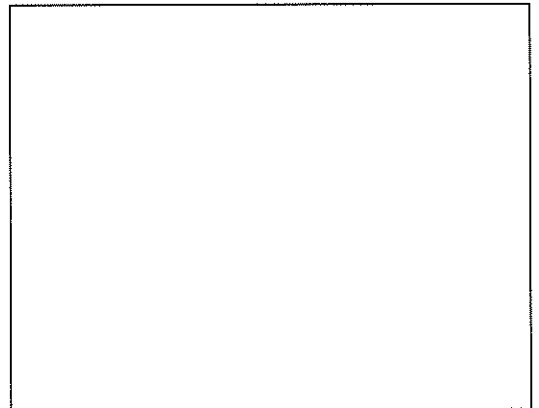
6. When timber is seasoned changes to its properties occur. List five changes that you consider to be important in the building and furniture industries.
 - a. _____
 - b. _____
 - c. _____
 - d. _____
 - e. _____

7. What is the meaning of the term 'equilibrium moisture content' (EMC)?

8. Significant dimensional change only occurs in the width or thickness of a board and not in the length.
- a. True b. False

9. Movement (dimensional change) in timber occurs:
- a. when temperature changes.
b. only when temperature and humidity change together.
c. with changes in relative humidity.
d. only during the seasoning process.

10. In the space provided on the right draw an end view of timber stacked for seasoning. Show three layers of boards, the strips and bearers.



11. What is the most important factor in air seasoning of timber?

12. Briefly explain why the ends of boards are sealed during air seasoning.

13. Kiln seasoning may produce seasoned timber in a few weeks.
- a. True b. False

14. Which factors can be accurately regulated in kiln seasoning?

a. _____ b. _____

15. Briefly describe the 'combined seasoning' process.

16. The diagram on the right shows the end grain of a 'green' sawn board. Draw the same board after shrinkage has occurred. Show the effects of shrinkage and cupping. Also show growth rings and medullary rays.



Before Shrinkage

17. Which property of wood is improved by preservation techniques?

After Shrinkage

18. List the main factors which cause deterioration of wood.

a. _____ b. _____ c. _____

19. What is the purpose of an 'ant cap'?

20. Why does well painted timber swell and shrink much less than unpainted timber when atmospheric conditions change?

21. What is the most significant advantage of preservation methods which involve chemical impregnation?

22. Chemical preservatives provide significant protection against weathering.

a. True b. False

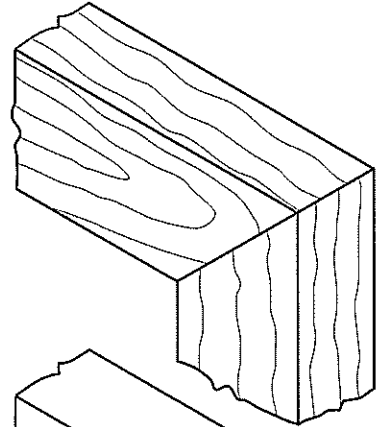
23. Briefly describe the process of 'pressure impregnation' of preservatives.

24. List the four elements that wood destroying fungi need to exist.

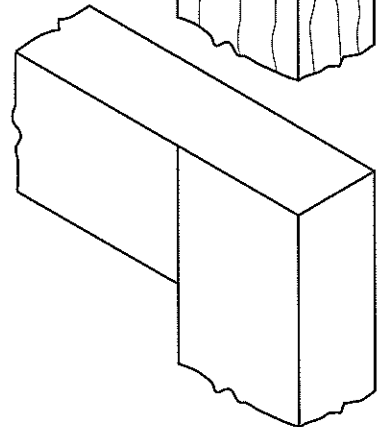
a. _____ b. _____
c. _____ d. _____

WOODWORK JOINTS

1. The diagram on the right illustrates a mitred joint. Show in the diagram and describe below how you could reinforce the joint.

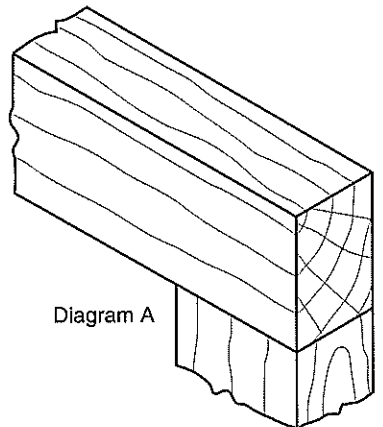


2. The incomplete drawing on the right shows two pieces of timber joined at right angles. Complete the sketch showing a corner bridle joint. Include end grain where necessary. List all the tools you would need to mark out, cut and finish the bridle joint.



3. Diagram A shows a haunched mortice and tenon joint. Which of the following best describes the joint?

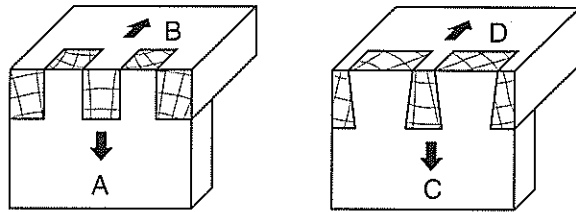
- a. Haunched through mortice and tenon.
- b. Haunched stubb mortice and tenon.
- c. Tapered haunch, stubb mortice and tenon.
- d. Tapered haunch, through mortice and tenon.



4. When would you use a wedged mortice and tenon joint in preference to other types of mortice and tenon joints?

5. The diagram on the right illustrates two woodwork joints. Can each piece of timber be removed from its joint in the direction of the arrow?

a. Yes b. No

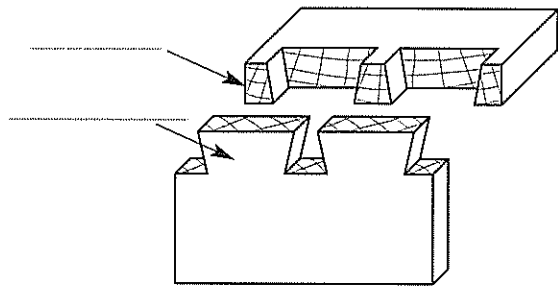


6. Briefly explain your answer to question 5 above.

7. Name the type of dovetail joint and its parts shown in the diagram on the right.

8. Which of the following is a suitable pitch (angle) for a dovetail joint?

a. 1 in 3
b. 1 in 4
c. 1 in 6
d. 1 in 10



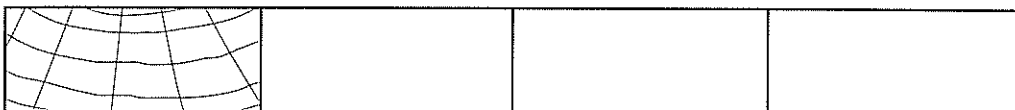
_____ or _____ Dovetail

9. The diagram on the right represents the end of a piece of 68 x 19 timber. Show the marking out for a lap dovetail joint suitable to join the 68 x 19 timber to a piece of 68 x 12 timber, clearly marking the waste material. The joint should have two dovetails.



Lap Dovetail

10. The diagram below illustrates four boards which are joined together with dowel joints. Neatly sketch the end grain in each board.



PARTICLEBOARD

1. Chemical treatments are used in the production of particleboard to prevent the growth of _____ and to prevent attack by _____ and _____.
2. Name the glue used to bond the wood flakes together in particleboard.

3. Particleboard is very stable compared with solid timber. Briefly explain this statement.

4. Would particleboard be suitable for the construction of a letter box to be attached to your front fence?
a. Yes b. No
5. Briefly explain the reasons for your answer to question 4 above, describing the effects of weather on standard particleboard.

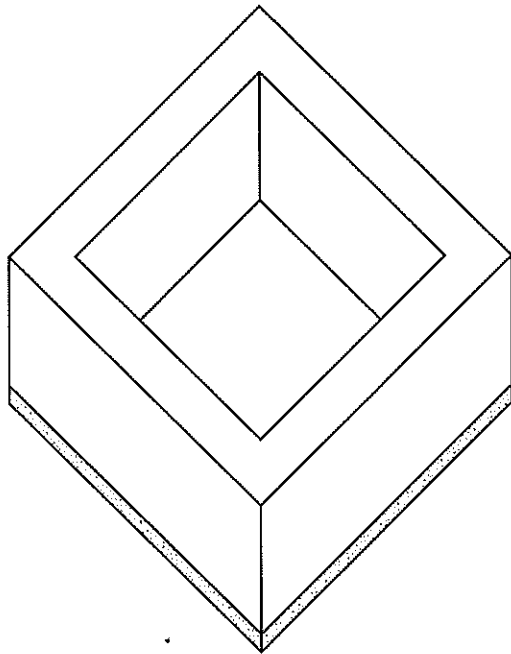
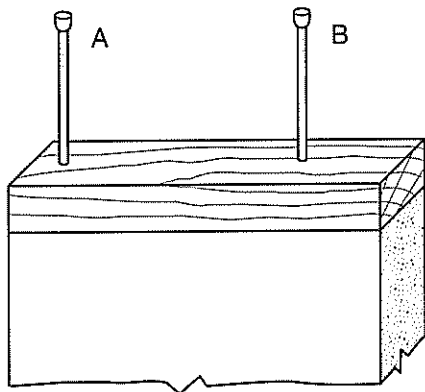
6. List two disadvantages of particleboard you would need to consider when joining with nails and screws.
a. _____

b. _____

7. Why is it usually necessary to apply two coats of glue to the edges when assembling particleboard projects?

8. Complete the sketch of the box made from particleboard by neatly drawing rebate housing joints in each corner.

9. The diagram below illustrates an edge strip being nailed to a piece of particleboard.



Nail B is positioned a suitable distance from the corner. Briefly describe the probable effect of driving nail A into the edge strip and the particleboard.

10. Why is particleboard which is used for flooring in the building industry usually darker in colour than standard particleboard?

11. List four advantages that would make the choice of particleboard preferable to solid timber for applications where large panel sizes were required, such as kitchen cupboards.

a. _____

b. _____

c. _____

d. _____

VENEER AND PLYWOOD

1. How is the thickness of veneer regulated in the rotary cutting method of production?

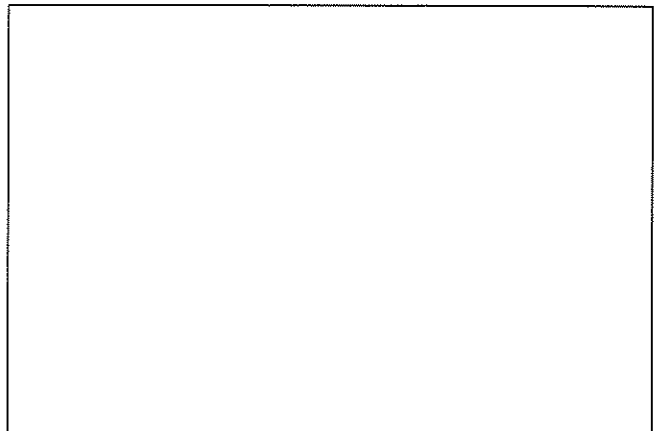
2. In the slicing method of producing veneer special grain effects can be achieved by selecting wood stock from a fork, knot or the butt of the tree. What actually causes the variations in the veneer pattern?

3. Briefly describe the 'slicing' method of producing veneer.

4. Why are sliced veneer sheets numbered as they are cut?

5. In the space provided on the right draw a neat sketch illustrating a log being converted to veneer by the rotary cutting or 'peeling' method.

Also show sheets of veneer being clipped to size.



6. Why are alternate veneers placed with the grain at right angles in the production of plywood?

HARDBOARD AND OTHER BUILDING BOARDS

1. Briefly describe the nine stages in the production of hardboard between when the logs are transported to the hardboard mill and the finished sheets are produced.
 - a. _____
 - b. _____
 - c. _____
 - d. _____
 - e. _____
 - f. _____
 - g. _____
 - h. _____
 - i. _____

2. List three disadvantages of hardboard which might affect construction work.
 - a. _____
 - b. _____
 - c. _____

3. MDF is manufactured using almost the same process as for particleboard. What is the main difference?

4. Medium density fibre board holds nails and screws better than particle board.
 - a. True b. False

5. Softboard was originally produced from the fibrous residue left after sugar cane is crushed.
 - a. True b. False

6. Which of the following would be a suitable use for softboard?
 - a. Cupboard doors b. Notice boards
 - c. Internal wall sheeting d. External wall sheeting

LAMINATED PLASTICS

1. The diagram on the right illustrates the structure of a typical laminated plastic material. The pattern layer is represented by the dark band.



a. What does the material below the pattern layer consist of?

b. The surface layer which covers the pattern is a clear plastic material called _____ formaldehyde.

2. State one disadvantage of cutting laminated plastic with a tenon saw.
-
3. An alternative method of cutting laminated plastic is the 'score and snap' method. Which side of the material should be scored?
- a. Face b. Back
4. Which of the adhesives listed below would be most suitable for use with laminated plastics in the home workshop.
- a. Polyvinyl Acetate b. Contact glue
c. Urea Formaldehyde d. Araldite

5. The diagrams on the right represent sections through particle board table tops edged and surfaced with laminated plastics. Which diagram illustrates the better method?

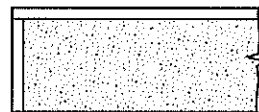


Diagram A

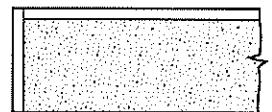


Diagram B

- a. Diagram A b. Diagram B
6. Briefly explain the reasons for your answer to question 5 above.
-
-

7. The diagrams on the right illustrate a file being used to trim plastic laminate glued to particle board. Which diagram shows the correct method?

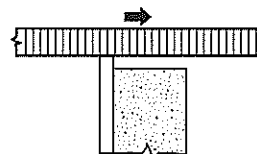


Diagram A

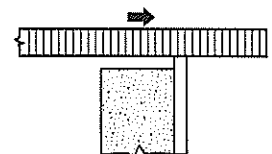
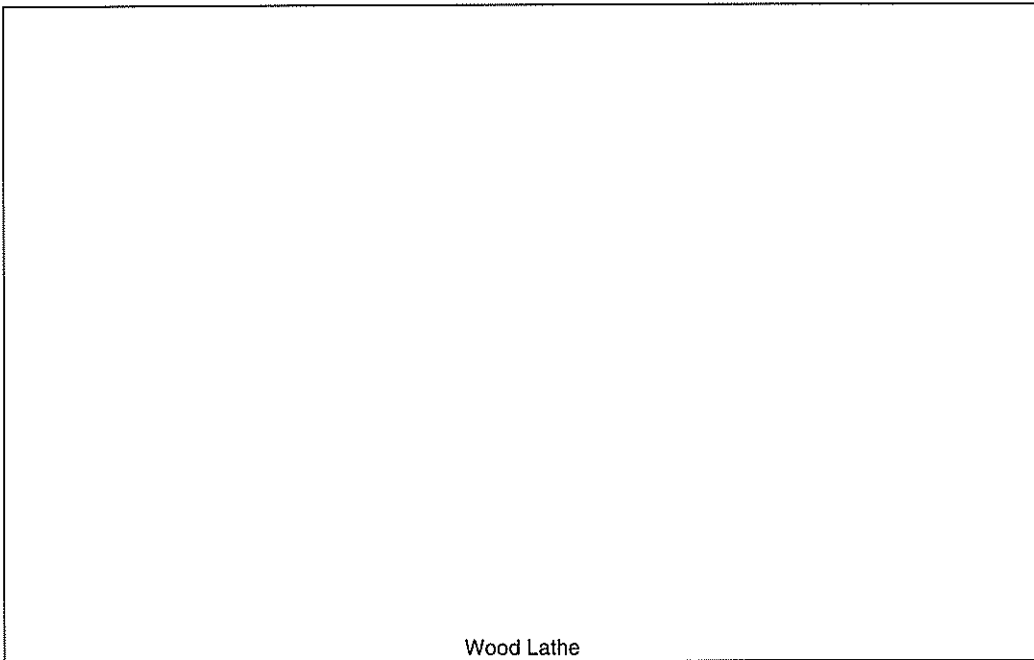


Diagram B

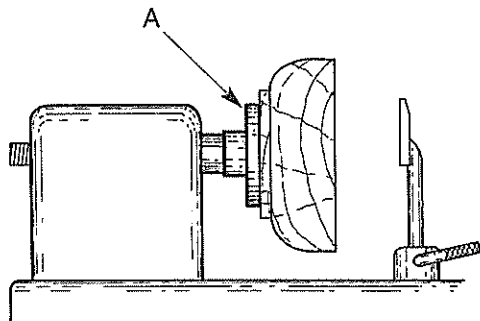
- a. Diagram A b. Diagram B

THE WOOD LATHE

1. In the space provided below draw a neat sketch of a typical wood lathe, showing and naming the headstock, bed, tailstock, centres, toolrest, clamps and handwheel.



2. The diagram on the right shows a wood lathe set up for turning a wooden bowl. Name the part marked 'A' to which the wood stock is fixed with screws.



3. Is the tool rest positioned correctly in the diagram?

a. Yes b. No

4. Briefly explain the reasons for your answer to question 3 above.

5. Why might a round nose chisel be used in preference to a gouge for turning out the centre of a wooden bowl?

6. The diagrams on the right illustrate a wooden bowl mounted on the headstock of a lathe with the tool rest positioned ready for turning.

Which diagram shows the correct direction of rotation?

- a. Diagram A b. Diagram B

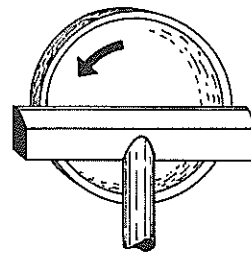


Diagram A

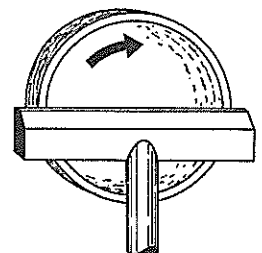


Diagram B

7. Diagram C shows a round nose tool positioned on the tool rest ready to turn out the centre of the bowl.

Is there anything wrong with the way the tool is positioned?

- a. Yes b. No

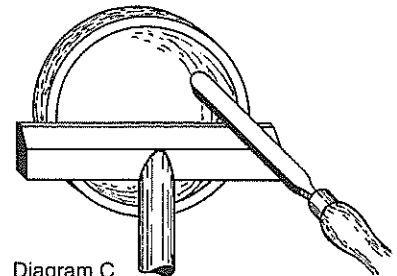


Diagram C

8. Briefly explain the reasons for your answer to question 7 above.

9. In the space provided below draw a neat sketch of a Spear Point lathe tool.

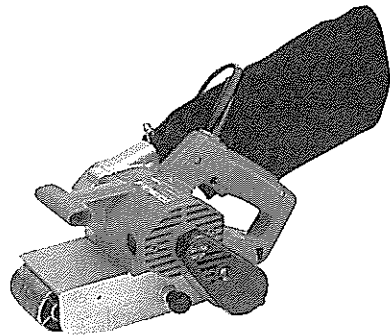
Spear Point Chisel

10. List four operating safety precautions that should be observed when turning a project such as a wooden bowl.

- a. _____
- b. _____
- c. _____
- d. _____

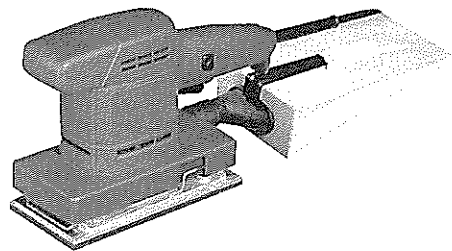
FINISHING & FIXING METHODS & MATERIALS

1. Name the portable power tool shown in the illustration on the right.



2. Briefly describe the type of work usually performed with the power tool on the right.

3. Name the portable power tool shown on the right.



4. What type of work is usually performed with the power tool on the right?

5. Briefly describe the mechanical operation of the power tool referred to in questions 3 and 4 above.

6. Why should you avoid sanding across the grain when a woodwork project is to be given a clear finish?

7. List four ways that paint could be classified.

a. _____

b. _____

c. _____

d. _____

8. Name the solvent that is generally used for oil based paints.
- _____
9. New timber usually requires a first coat of special paint called _____
then an _____ followed by the finish coat.
10. Why are stoppings or 'putty' used in wood finishing?
- _____

11. Linseed oil putty is usually used under _____ paint.
12. Some stoppings are available in powder form. Briefly describe how you would prepare these products for use.
- _____

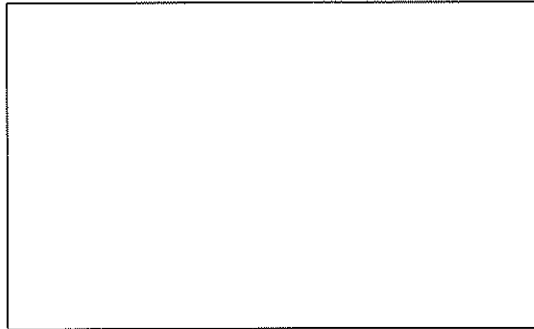
13. Why would it not be advisable to use PVA glue in external applications?
- _____
14. Briefly describe how you would use contact glue to finish a particle board table top with laminated plastic.
- _____

15. Name the parts of a 'two part' epoxy adhesive such as Araldite.
- a. _____ b. _____
16. Name the abrasive material which is manufactured from coke and sand and fused together. It is often used to make 'wet and dry' abrasive paper.
- _____
17. The grade of wet and dry abrasive paper is denoted by a number on the back of the sheet. The larger the number:
- a. the finer the grit. b. the coarser the grit.

18. Why is water used with wet and dry abrasive paper?

19. In the space provided on the right draw a neat sketch of a piece of 12mm timber and a piece of 19mm timber that are to be screwed together using 25mm countersunk wood screws.

Clearly show the countersink, clearance (shank) and pilot (core) holes that must be drilled to receive a screw.



20. State reasons why it is necessary to drill shank and core holes for most wood screws.

Shank hole.

Core hole.

21. Why are most particleboard screws made with a full length thread?

22. State a possible advantage of using short thread particleboard screws in appropriate situations.

23. Name the screw driver you would use for screws which have a star shaped slot in the head.

24. Which of the following drill bits would cut the fastest when drilling wood?

a. High speed twist drill

b. Single flute wood drill

SOME PLASTIC MATERIALS

1. What is the full name for the plastic material commonly called PVC?
.....
2. How is PVC made permanently flexible in the manufacturing process?
.....
.....
.....
3. Which of the following statements is incorrect?
 - a. PVC is a thermoplastic material.
 - b. PVC foam is used to insulate refrigerators.
 - c. PVC is used in the manufacture of vinyl wallpaper.
 - d. PVC is used to insulate electrical wiring.
4. What is the common name for the plastic material Polyethylene?
.....
5. Name a plastic material often used to manufacture bodies of power tools.
.....
6. Name a plastic material used in the manufacture of a clear varnish and spongy foam.
.....
7. What is the full name of the plastic material commonly called PVA?
.....
8. Name a product made from PVA which is used in woodworking.
.....
9. What causes the expansion of polystyrene beads when heat is applied during the manufacture of polystyrene foam?
.....
.....

10. List two common products which are made from polystyrene foam.
- a. _____ b. _____
11. Which of the following statements is incorrect? Polyamide resins are:
- a. engineering grade plastics.
b. thermosetting resins.
c. commonly called nylons.
d. very strong.
12. Name a plastic material which is used in the production of chrome plated fittings.
- _____
13. Briefly describe the process by which liquid polyester resin sets.
- _____

14. Formaldehyde resins are thermoplastics.
- a. True b. False
15. Which of the formaldehyde plastics is used in a versatile adhesive with wide application in industry such as the manufacture of MDF?
- _____
16. The main disadvantage of Phenol Formaldehyde is that it cannot be successfully coloured in the manufacturing process.
- a. True b. False
17. Formaldehyde plastics are hard and rigid.
- a. True b. False
18. Which property of formaldehyde plastics is very important in the manufacture of light switches and power points?
- _____

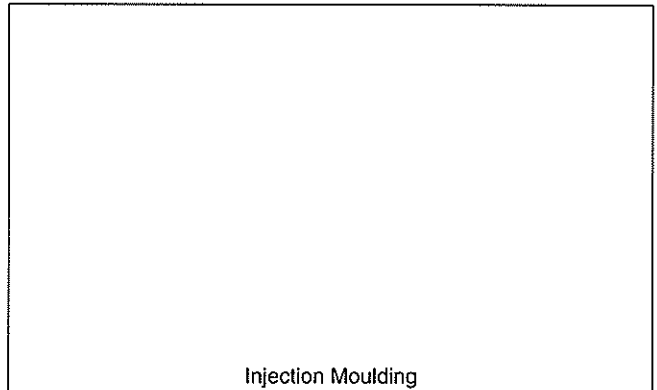
PLASTICS MANUFACTURING PROCESSES

1. The raw materials used in the industrial processes of extrusion, injection moulding, blow moulding and vacuum forming are mainly:

- a. thermoplastics.
- b. thermosetting plastics.
- c. laminated plastics.
- d. liquid plastic materials.

2. In the space provided on the right draw a neat sketch illustrating the industrial injection moulding process.

Clearly show and name the mould (die), plunger and plastic material.



3. Name the process in which plastic granules are melted in a chamber and forced through a die to produce lengths of pipe, tube, rod etc.

4. Briefly explain the difference between Blow Moulding and Vacuum Forming industrial processes.

5. Compression Moulding is a much faster process than Injection Moulding.

- a. True
- b. False

6. Briefly describe the Calendering process used to manufacture plastic film.

A PLASTICS DESIGN PROJECT

SITUATION: A friend who works for an accountant continually misplaces her pens amongst the papers and numerous other articles that are usually on the desk. She knows that you have a talent for design in plastic and wood, and she has asked for your help.

BRIEF: Design and construct a desk set that will hold three pens (accountants use green, red and black pens for different purposes). Overall dimensions of the project should be not more than 150 x 70 x 70. The desk set could be made entirely from plastic materials or it could combine wood and plastic.

INVESTIGATION: The following questions are structured to help you work through a procedure which should result in the collection of information on which you can base your design.

1. List the design factors mentioned in the brief which relate to:
 - a. Size: _____
 - b. Materials: _____
 - c. Function: _____
2. List other design factors you consider to be important in the project.

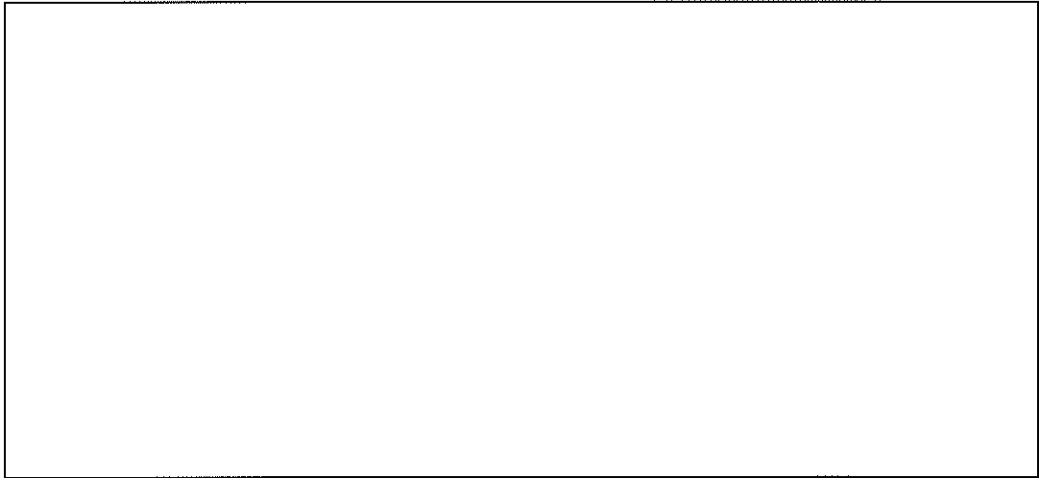
3. List available materials (incl. finishing materials) which may be suitable for the project.

4. List all available tools and equipment you might need to construct the project.

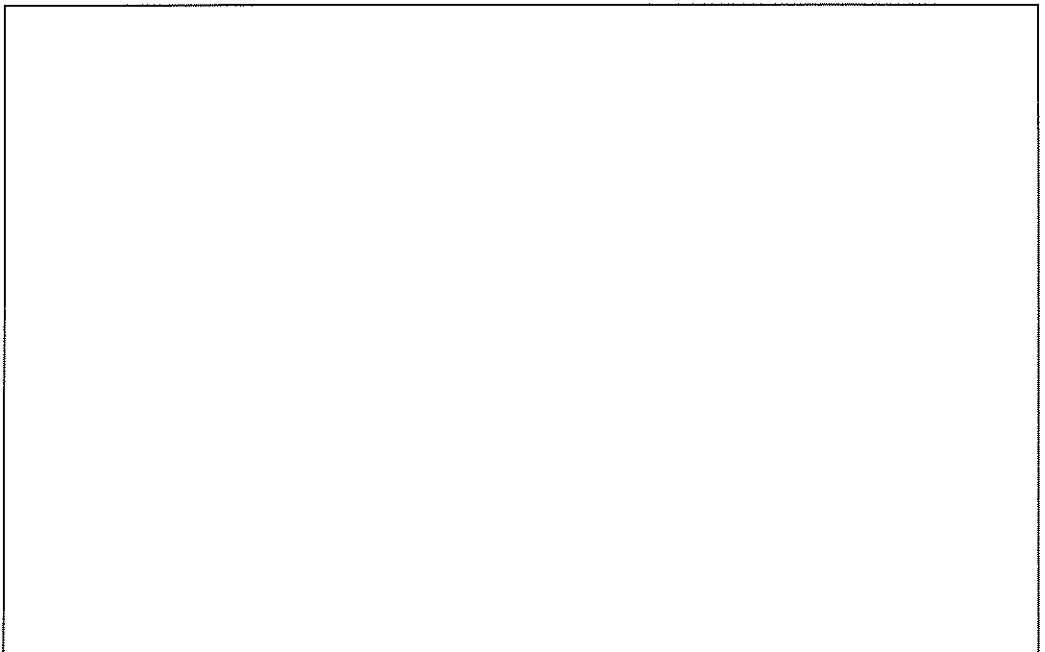
5. Having listed design factors, available materials, tools and equipment you should now begin to develop your ideas about the shape and size of the pen holder and any joining methods you may need to use.
 - a. How would you join acrylic to acrylic or PVC to PVC?

 - b. How would you join plastic to wood?

6. Firstly, develop your design ideas by drawing rough sketches (on another piece of paper). When you have finalised your design draw a front view and side view in the space provided below. Show all relevant dimensions, joining methods and finishes. Use an appropriate scale.



7. In the space provided below draw the development of all plastic parts of your design. Show all necessary dimensions and use a suitable scale.



8. **EVALUATION:** Does your design satisfy all the design factors you have listed? If you think it does then construct the desk set and have it assessed by your teacher. If your design does not satisfy all requirements make the necessary changes to the drawings above before commencing construction.

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