Unit 3
Components and assemblies
Worksheet 3

Language note

*layout* = the way that something is arranged  
*laid out* = arranged on a flat surface  
*profile* = the amount of public attention and notice that something receives  
*configuration* = the particular arrangement or pattern of a group of related things

1. What is meant by *components* and *assemblies*? What is the connection between the two?

A *component* is an individual *part*, such as the wheel of a car. An *assembly* is a number of *components* that have been *put together/assembled*. For example, a car engine is an *assembly, assembled* from hundreds of *components* such as pistons, shafts, electronic components, etc.
2. What is meant by *shapes* and *features*? The CD is a circular *shape*. One of its *features* is a hole in the centre.

- Do task 1 (page 22)
- Task 2a, homework
- Look at the book, do task 2b
  
  The *profile of the pins* means the shape of the individual pins, for example a rectangular cross-section or a circular cross-section.

- A *standard configuration* means a uniform arrangement, for example in a given country all plugs have a standard layout – they all exactly the same.

- Task 2c, homework

**NOTE 1**

- *circular, rounded, rectangular, cylindrical, linear, triangular*
• The nouns and adjectives are usually different (a rectangle / a rectangular shape,
a cylinder / a cylindrical shape), but there are exceptions (a square / a square shape,
an oval / an oval shape).

Terms in relation to a mains electrical circuit.

✓ live = the wire through which current flows into an appliance
✓ neutral = the wire through which current flows out of the appliance
✓ earth = the electrical connection between the circuit and the ground
✓ live also means a circuit is energized, i.e. that current is flowing around the circuit.

• Do task 2d

Answers
2 rounder 3 rectangular
4 cylindrical 5 linear 6 triangular
• Do tasks 2a, 3b & 4a at home
• Do task 4b

Answers
1. Advantages: The plug resists pullout forces. Nothing can touch the pins if the plug is partially pulled out.
Disadvantages: It’s difficult to pull out.
2. Advantages: Children can’t stick things in the socket.
Disadvantages: If the mechanism is too sensitive, it can be difficult to insert

Explaining and assessing manufacturing techniques

*manufacturing* = producing things in large numbers (*manufacturer n.*)
*factory* (British English) / *plant* (American English)
*production line, mass produce, mass production*
Language note

Often, the names of tools (nouns) are exactly the same as the verbs that describe their function, for example to saw with a saw, to drill with a drill, to hammer with a hammer. The concept of *verbing* (making verbs from nouns) is common in industry when describing the functions of highly specific tools and machines, for example to *diamond drill* (using a diamond drill), to *jackhammer* (using a jackhammer/pneumatic/ˈnjuːmætɪk/ breaker), to *crane* (lift using a crane). Sometimes, however, the nouns that describe tools and machines differ from the verb describing their actions, as the noun ends with *-er*, for example to *grind* with a grinder, to *power wash* with a power washer.

- Do task 5
- Task 6a, homework
Look at the meaning of the following words:

- **hardness** = a material’s resistance to abrasion
- **toughness** = a material’s resistance to breaking when subjected to tension (stretching) or bending
- **thermal properties** = a material’s characteristics at different temperatures
- **thermal stability** = a material’s ability to behave consistently at different temperatures (important because cutting processes such as sawing and grinding generate heat, which can damage thermally sensitive materials)
- **electrical properties** = a material’s ability to conduct electricity and its behavior when an electric current passes through it (important because some cutting processes use an electric arc (powerful flow), only suitable with materials that are effective electrical conductors – i.e. metals)
• **edge quality** = the degree of smoothness of the edge of a material after it has been cut (important because some techniques produce smoother cuts than others)

• **production volume** = the amount produced (usually by a factory) (important because some cutting techniques are relatively time-consuming, making them unsuitable for mass production)

• **cutting wheel** = an abrasive or toothed wheel designed to cut materials (note that milling machines use toothed metal cutting wheels to progressively shave thin layers of metal from the surfaces of components producing swarf = metal shavings produced by milling machines)

**see these pictures in these websites**
http://www.flickr.com/photos/7751500@N03/1548176537/

• **grinding** = using an abrasive wheel to grind away the surface, producing hot particles of molten metal due to heat from friction in the form of sparks

**see the pictures in this website**
http://beta.photobucket.com/images/grinding+wheel/
- **combustible** = can be burned
- **shearing** = cutting

- Do task 6b

**Answers**
1. Sawing  
4. Milling
2. Shearing  
5. Flame-cutting
3. Drilling

- Do task 6c

**Answers**
2. guillotine  
5. abrasive wheel
3. kerf  
6. hole-saw
4. toothed blade

**Language note**
- **high-pressure waterjet cutting** (= cutting materials using extremely powerful jets of water)

Look at this video
http://www.youtube.com/watch?v=h0gofs7gg8Y
• *heat distortion* (= changes in the shape of a component, due to heating).

• Do task 7a

**Answers**

• *secondary operations* = additional machining, such as polishing *net-shaped parts*: parts with accurately cut edges; often intricate (complex/complicated) shapes

• *heat-affected zone* = the area modified by high temperatures (resulting from the heat of cutting)

• *mechanical stresses* = physical forces such as shear forces when sawing or guillotining metal

• *narrow kerf* = narrow thickness of material removed during cutting; especially easy to do with waterjet cutting

• *tightly nested*: when several components are cut from the same piece of material the components can be placed close together, making better use of the material

• Do tasks 7b & 7c at home
• Task 8, homework.

Explaining jointing and fixing techniques

• Do task 9
• Do task 10a at home.
• Do task 10b

Answers
1 Mechanical fixings: screw, rivet, clip
2 Non-mechanical fixings: weld, adhesive

• Do task 10c

Answers
1 weld 2 bolt 3 adhesive
4 screw 5 rivet 6 clip

Note
There are two main types of welding:
• gas welding – often using a mixture of oxygen gas and acetylene gas, commonly referred to as oxy-acetylene or oxy-fuel (this technique can also be used for cutting metal)

Look at this video
http://www.youtube.com/watch?v=9P_QhTOnkQ
• **arc welding** – using an electrical supply to generate an electric arc, which generates a high temperature

Look at this video
http://www.youtube.com/watch?v=TeBX6cKKHWY

• Do task 10d

**Answers**
1 joining; fixing
2 bolting; riveting
3 bonding; welding; gluing

**Extension activity: more vocabulary**

Look at the similarities/differences between the nouns and verbs used to describe joints.

**Noun / Verb**
- *a bolt / to bolt*
- *a screw / to screw*
- *a connection / to connect*
- *a rivet / to rivet*
- *a clip / to clip*
- *a bond / to bond*
- *some glue / to glue*
• some adhesive /to adhere
• a weld to weld
• a fixing /to fix
• a joint /to join

• Do task 11b

Answers
1 on 2 each other 3 together
4 onto/to 5 to

• Do task 11c

Answers
1 Main advantage: They can be removed easily.
Main disadvantage: They can work loose.
2 It can’t be removed easily.
3 Fixings can be inadequately tightened.
Adhesives can be used on improperly prepared surfaces. Welds can be flawed.
Extension activity: more vocabulary

Look at the meaning of some of the terms on the webpage in more detail.

- *disconnected* = the opposite of *connected*, can describe a joint and also an electrical connection/supply
- *tightly* = the opposite of *loosely*. If a bolt is *tight* it has been turned with a large amount of force
- *vibration* = shaking at a high frequency
- *flawed welds* = the presence of small, bubble-like air pockets inside the mass of welded metal reducing the strength of the weld. Where quality is critical, welds are sometimes x-rayed to check for flaws

- Do task 12a

Suggested answers

1. In early aircraft, timber frames were joined together with adhesive / glued together, or screws / screwed together.
2. In jet aircraft, alloy body panels are joined together with rivets / riveted together.
3. In aircraft cabins, the seats are fixed to the floor with bolts / bolted to the floor.
4. In aircraft cockpits, the windshield is bonded to the fuselage with adhesive / glued to the fuselage.

**Describing positions of assembled components**

- What is meant by *relative positions*?
  Positions of things *related to / in relation to* other things.
- Explain the relative positions of the main components of a chair.
  *legs, seat, backrest, armrests*. For example, the legs are below the seat, the backrest is above the seat, the armrests are above the seat, at the sides.
Larry Walters and the flying garden chair

Guess what real event this headline could be about.

- *Do task 13a*
- *Do task 13b*

**Answers**

a 2 b 3 c 4 d 1

- *Do 13c*

**Answers**

a. The balloons climbed faster than expected, then entered controlled airspace adjacent to an airport.
b. A rope tangled with a power line, then Mr. Walters was arrested.
c. The modern equivalent, cluster ballooning, is not a mainstream sport, but is becoming more popular.
d. A garden chair, helium-filled weather balloons and ropes.

- *Do 14a*
Answers
a. over d around
b. below; beneath; underneath e outside
c. alongside; adjacent to; beside f inside; within

• Do 14b