

10 Engineering

A Engineering is based principally on **physics**, **chemistry**, and **mathematics**, and their extensions into materials science, solid and fluid **mechanics**, **thermodynamics**, **transfer** and **rate processes**, and **systems analysis**.

Engineering as a profession involves different tasks. It can refer specifically to the manufacture or assembly of **engines**, **machine tools** and **machine parts**. It is also used more generally to describe the creative application of scientific principles to **design**, **develop**, **construct** and forecast the behaviour of **structures**, **apparatus**, machines, **manufacturing processes** and works.

The function of scientists is to know, while that of **engineers** is to do: they must solve specific problems.

See also: Chemical (12), Civil (20, 21), Electrical (16), Electronic (17, 18), Mining (22), Petroleum (23, 24), Production (1, 2), Construction (15).

B Different *branches of engineering* require different *equipment* and are based on different *processes*.

Branches of engineering

The following words/phrases are all followed by 'engineering'

chemical • civil • electrical • electronic • highway • hydraulic • industrial
mechanical • mining • petroleum production • production • structural

Equipment in engineering

boiler • crane • gas engine • machine tool • pump • turbine

Processes in treating metals

anneal • anodize • electroplate • forge • found • galvanize • grind
harden • mint • plate • roll • soften • temper • tinplate

C Notice the following adjective endings:

-al • chemical • mechanical • physical • structural
-ial • industrial
-ic • electronic • hydraulic

Notice the following verb endings:

-en • harden • soften
-ize • anodize • galvanize

Notice the following nouns which are a plural form but are normally used with a singular verb

mathematics • mechanics • physics • thermodynamics

TASKS

1 Match the following verbs with the correct definition.

anneal	to melt metal and then pour it into a form, e.g. iron components
anodize	to make thin sheets of metal by passing it between large rollers, e.g. steel
electroplate	to shape metals by heating and then hammering, e.g. horse shoes
forge	to make materials tough by cooling them slowly, e.g. glass
found	to make something softer, e.g. fibres
galvanize	to heat and then cool metals to obtain the required hardness and elasticity, e.g. steel
grind	to cover with a thin layer of metal using electrolysis, e.g. car components
roll	to protect from rusting by coating in zinc, e.g. food cans
plate	to give a metal a protective coat by using it as an anode in electrolysis, e.g. car components
soften	to polish or sharpen by rubbing on a rough surface, e.g. stone
temper	to cover one metal with a thin layer of another, e.g. silver plate

2 Complete the following sentences with a form of the word in brackets.

- In the _____ industry, _____ develop processes for producing plastics, fibres, medicines, etc. from simple chemicals. (chemistry)
- Producing steel using the Bessemer process is one of the best-known _____ processes. (industry)
- Most _____ devices need oil as a lubricant. (mechanics)
- Following the earthquake, every building had to be inspected to see whether it had suffered any _____ damage. (structure)
- Certain chemicals are added to glue to _____ it. (hard)
- Excavators and power shovels are two types of _____ equipment used by _____ when they are removing rocks from the ground. (mine)

3 Here is an extract from a speech made by a careers advisor to a group of students choosing their future courses of study at university. Complete the speech by choosing one of the words from the box.

machines • highway • mechanical • chemical • civil • physics
electrical • develop • production • electronic

Engineering students should have an understanding of maths, (a) _____ and chemistry. Working with pharmaceuticals, food, mineral processing and chemical manufacturing, a (b) _____ engineer is trained to understand, design, control, and investigate material flows. If you enjoy problem solving and find projects such as the Channel Tunnel and the Three Gorges Dam interesting, (c) _____ engineering may be for you. You will produce creative designs at an economical price while paying due concern to the environment. If your interest is in road building then you may decide to follow a specialized course in (d) _____ engineering. By studying (e) _____ and (f) _____ engineering you learn about the design of complete systems, such as computers, controllers, power and transport systems. (g) _____ engineers plan, design and (h) _____ a wide range of things: washing machines, cars and spacecraft. (i) _____ engineers work very closely with mechanical engineers, to make new products at the right price, on time and in the correct quantity. As well as designing and selecting (j) _____ and materials, they also organize people and finance.