1. Chisels used for metal cutting are

(1) hardened
(2) annealed
(3) tempered
(4) Both (1) and (3)

Ans: 4

Hardening and Tempering of Chisel

In order to make the cutting edge last longer even the tapered part of a chisel is made hard and the edge is tempered

2. Slip gauges are made of

(1) Cast iron
(2) Aluminium
(3) Alloy steel
(4) Copper

Ans:3

Most of the slip gauges are produced from high grade steel, hardened and stabilized by heat treatment process to give a high degree of dimensional stability. Slip gauges can be made from tool steel, chrome plate steel.

Stainless steel, chrome carbide, tungsten carbide etc.

Slip gauges or Gauge blocks (also known as **gage blocks**, **Johansson gauges**, **slip gauges**, or **Jo blocks**) are a system for producing precision lengths. The individual gauge block is a metal or ceramic block that has been precision ground and lapped to a specific thickness. Gauge blocks come in sets of blocks with a range of standard lengths. In use, the blocks are stacked to make up a desired length (or height).

An important feature of gauge blocks is that they can be joined together with very little dimensional uncertainty. The blocks are joined by a sliding process called *wringing*, which causes their ultra-flat surfaces to cling together.

Gauge blocks are usually made either from hardened alloy tool steels, ceramics or cemented carbides (such as tungsten carbide or tantalum carbide). Often the carbide has a hardness of 1500 Vickers hardness.

https://en.wikipedia.org/wiki/Gauge_block

3. If the grain diameter increases, then yield strength of metal

(1) decreases
(2) increases
(3) remains constant
(4) none of these

Ans: 1

4. Microstructure that develops in steel depends on

(1) Heat treatment process
(2) Carbon content
(3) Both (1) and (2) above
(4) None of the above

Ans: 3

Microstructure is the very small scale structure of a material, defined as the structure of a prepared surface of material as revealed by an optical microscope above 25× magnification. The microstructure of a material (such as metals, polymers, ceramics or composites) can strongly influence physical properties such as strength, toughness, ductility, hardness, corrosion resistance, high/low temperature behaviour or wear resistance. These properties in turn govern the application of these materials in industrial practice.

Microstructure at scales smaller than can be viewed with optical microscopes is often called nanostructure, while the structure in which individual atoms are arranged is known as crystal structure. The nanostructure of biological specimens is referred to as ultrastructure. A microstructure's influence on the mechanical and physical properties of a material is primarily governed by the different defects present or absent of the structure. These defects can take many forms but the primary ones are the pores. Even if those pores play a very important role in the definition of the characteristics of a material, so does its composition. In fact, for many materials, different phases can exist at the same time. These phases have different properties and if managed correctly, can prevent the fracture of the material.

https://en.wikipedia.org/wiki/Microstructure

…….

Composition and processing establishes the microstructure and that microstructure influences many properties and service behavior

Microstructures described include pearlite, bainite, proeutectoid ferrite and cementite, ferrite-pearlite, and martensite

……………………

cementite has the characteristics of a ceramic: very hard and brittle, with low toughness and little resistance to crack initiation and propagation. The mixture of ferrite and cementite is called *pearlite*, named because it looks like mother of pearl under a microscope, with alternating layers of ferrite and cementite.

Bainite is another microstructure that can form when austenite is cooled. It typically consists of a combination of ferrite, cementite, and retained austenite. Because the cooling rate to form bainite is slower than the cooling rate needed to form martensite, carbon has some opportunity to diffuse out of the FCC austenite, allowing for the formation of BCC ferrite. The remaining austenite is enriched with carbon, which leads to cementite precipitation. However, the slow cooling rates that produce the flat-layered, brittle structure of pearlite do not exist; the higher cooling rates needed to produce bainite give the harder components of the microstructure enough energy to transform into a more rounded shape.

Bainitic microstructures have the best balance of strength and ductility. The cooling rate is fast enough to increase the strength, while the rounded hard microstructural constituents are not as prone to crack initiation and propagation than if they were flat and elongated. The strength-toughness balance is why an increasing number of automotive wheels and suspension arms are being made from bainitic steels.

https://www.thefabricator.com/thefabricator/article/metalsmaterials/a-review-of-steel-microstructures

5. Thoria is a

(1) fiber reinforced composite
(2) particle reinforced composite
(3) dispersion-strengthened composite
(4) concrete

Ans: 3

6. In galvanizing, layer of zinc is applied to the surface of steel by

(1) Hot peening
(2) Cold peening
(3) Hot dipping
(4) Cold dipping

Ans: 3

7. Intergranular corrosion occurs

(1) along grain
(2) along grain boundaries
(3) at the surface
(4) in the core of material

Ans: 2

8. In superconducting state, materials are

(1) paramagnetic
(2) ferromagnetic
(3) diamagnetic
(4) none of the three are correct

Ans: 3

9. Blow holes and porosity in a cast ingot may be eliminated by

(1) Hot forging (2) Cold forging
(3) Hot rolling (4) Eithe (1) or (2)

Ans: 4

10. Lead pipe is made by

(1) Drawing (2) Deep drawing
(3) Sand casting (4) Extrusion

Ans: 4

Lead Pipe (Seamless) is made from **Pure Lead Metal** (99.97% min.) or Lead Alloys, which is readily fabricated by extrusion. Lead Metal have excellent property of corrosion resistance and flexibility, **Lead Pipes** finds many uses in the chemical industry. **Lead Pipe** for these applications is made from either chemical Pure Lead or up to 6% Antimonial Lead Alloy

In present time, **Lead Pipes** are mainly used for carriage of corrosive chemicals in chemical plants. The appropriate composition of Lead with other alloying Metal is extruded for cutting into short length 'sleeves' which is used for jointing of Lead Sheathed Cables

https://www.gravitaindia.com/products/lead-pipe/

11. Automotive cylinder block is made by

(1) Investment casting (2) Sand casting
(3) Die casting (4) Extrusion

Ans: 2

12. Product of the first breakdown of the ingot in rolling is

(1) billet (2) bloom (3) slab (4) plate

Ans: 2

Semi-finished casting products are intermediate castings produced in a steel mill that need further processing before being finished goods. There are four types: *ingots*, *blooms*, *billets*, and *slabs*

Ingot

Ingots are large rough castings designed for storage and transportation. The shape usually resembles a rectangle or square with generous fillets. They are tapered, usually with the big-end-down.

Bloom

In the era of commercial wrought iron, blooms were slag-riddled iron castings poured in a bloomery before being worked into wrought iron. In the era of commercial steel, blooms are intermediate-stage pieces of steel produced by a first pass of rolling (in a blooming mill) that works the ingots down to a smaller cross-sectional area, but still greater than 36 in^2 (230 cm^2). Blooms are usually further processed via rotary piercing, structural shape rolling and profile rolling. Common final products include structural shapes, rails, rods, and seamless pipes.

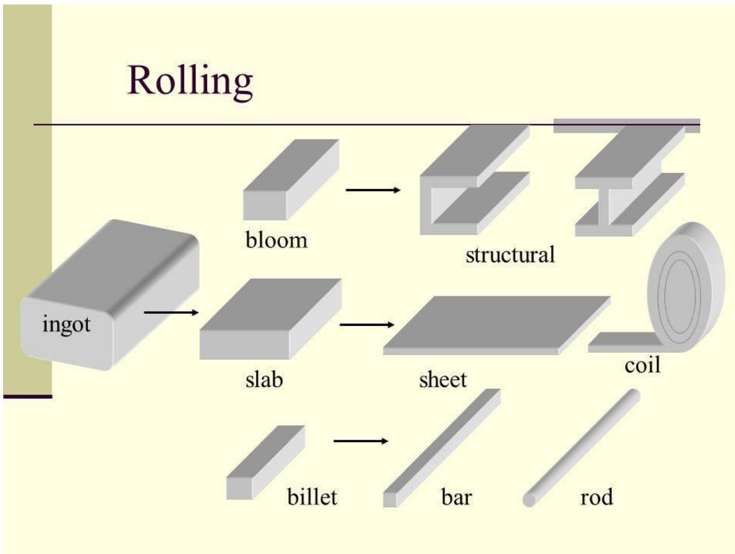
Billet

A **billet** is a length of metal that has a round or square cross-section, with an area less than 36 in^2 (230 cm^2). Billets are created directly via continuous casting or extrusion or indirectly via hot rolling an ingot or bloom.[1][2][4] Billets are further processed via profile rolling and drawing. Final products include bar stock and wire.[3]

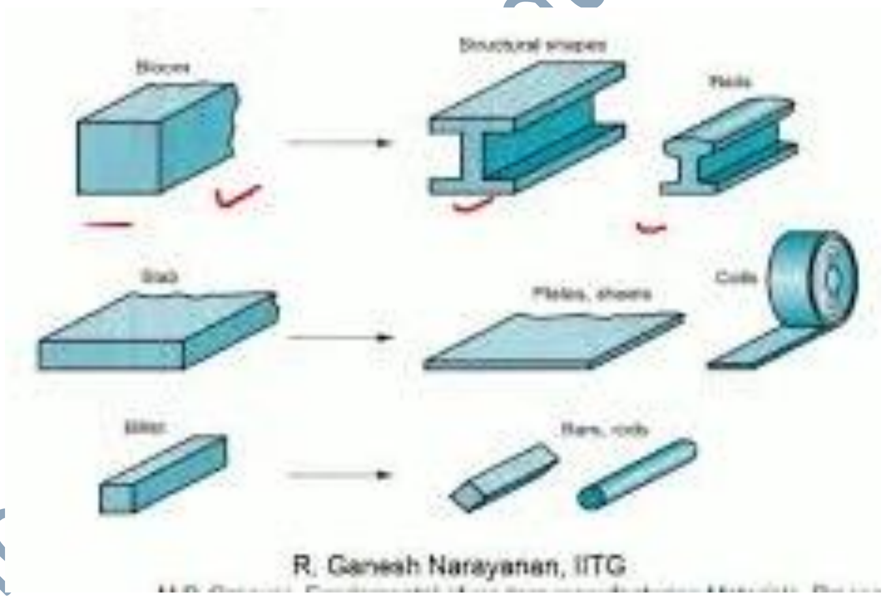
Slab

A slab is a length of metal that is rectangular in cross-section. The slab is created directly by continuous casting or indirectly by rolling an ingot on a slabbing mill.[1] Slabs are usually further processed via flat rolling, skelping, and pipe rolling. Common final products include sheet metal, plates, strip metal, pipes, and tubes.[3] Slab are mainly produced through blast furnace route. One of the reasons to preferably produce slab through BF route is to achieve high quality

https://en.wikipedia.org/wiki/Semi-finished_casting_products



https://www.facebook.com/learnsteelmanufacturing/photos/a.1740315012929948/1903472046614243/



………

A bloom is a rolled steel workpiece with a square cross section of about 150 mm by 150 mm. The starting work unit for a bloom is an ingot heated in a soaking pit. A slab is rolled from an ingot or a bloom and has a rectangular cross section of about 250 mm by 40 mm. A billet is rolled from a bloom and has a square cross section of about 40 mm by 40 mm.

13. Lead scathing of cable is made by

(1) rolling (3) extrusion
(3) forging (4) investment casting

Ans: 3

14. Rail road rails are made by

(1) forging (2) rolling (3) extrusion (4) drawing

Ans: 2

15. Preheating is essential in welding of

(1) High speed steel (2) German silver
(3) Stainless steel (4) Cast iron

Ans: 4

Preheating involves heating the base metal, either in its entirety or just the region surrounding the joint, to a specific desired temperature, called the preheat temperature, prior to welding. Heating may be continued during the welding process, but frequently the heat from welding is sufficient to maintain the desired temperature without a continuation of the external heat source. The interpass temperature, defined as the base metal temperature between the first and last welding passes, cannot fall below the preheat temperature. Interpass temperature will not be discussed further here. Preheating can produce many beneficial effects; however, without a working knowledge of the fundamentals involved, one risks wasting money, or even worse, degrading the integrity of the weldment.

Why Preheat?

There are four primary reasons to utilize preheat: (1) it lowers the cooling rate in the weld metal and base metal, producing a more ductile metallurgical structure with greater resistant to cracking (2) the slower cooling rate provides an opportunity for any hydrogen that may be present to diffuse out harmlessly without causing cracking (3) it reduces the shrinkage stresses in the weld and adjacent base metal, which is especially important in highly restrained joints and (4) it raises some steels above the temperature at which brittle fracture would occur in fabrication. Additionally, preheat can be used to help ensure specific mechanical properties, such as notch toughness.

https://www.millerwelds.com/resources/article-library/preheat-in-welding-what-is-it-and-when-should-you-use-it#:~:text=Welding%20preheat%20is%20commonly%20used,shipbui lding%20and%20heavy%20equipment%20applications.

Preheating in welding is used to help ensure weld quality and reduce the occurrence of cracking and other problems that can result in costly rework. Welding preheat is commonly used before welding steel or steel alloy pipes or plates that are 1 inch thick or more. Preheating is often required in shop and field welding for oil and gas, transmission pipelines, power plants, structural construction, mining, shipbuilding and heavy equipment applications.

………………

16. The purpose of scrap steel in the charge for blast furnace is

(1) to form a slag by commination with impurities
(2) to control the composition/grade of cast iron produced
(3) to act as an aggregate of iron-bearing mineral
(4) none of the three

Ans: 2

17. The molten oxide product of smelting in blast furnace is

(1) pig iron (2) slag (3) sponge iron (4) none of these

Ans: 1

18. Cope in foundry practice refers to

(1) middle portion of the moulding box
(2) bottom half of the moulding box
(3) coating on the mould face
(4) top half of moulding box

Ans: 4

19. Among the following materials, the most suitable material for withstanding shock and vibration without danger of cracking is

(1) Malleable cast iron (2) Gray cast iron
(3) White cast iron (4) Graphite

Ans: 1

20. Which of the following element is added to steel to import high strength, abrasion resistance, and toughness?

(1) Magnesium
(2) Manganese
(3) Sulphur
(4) Tungsten

Ans: 2

21. Pressing of ore fines, with or without a binder into a block of suitable size and shape and then subjecting the same to a hardening process is known as

(1) Sintering
(2) Pelletization
(3) Briquetting
(4) None of these

Ans: 3

22. Which of the following material has more shrinkage allowance?

(1) Lead
(2) Cast iron
(3) Aluminium alloy
(4) Brass

Ans: 1

23. The major problem in welding of stainless steel is

(1) formation of oxide film
(2) high electrical resistance
(3) poor thermal conduction
(4) formation of chromium carbide at grain boundaries

Ans: 4

24. Butt welding of dissimilar metal rods can be performed by

(1) Laser beam welding
(2) Electron beam welding
(3) Flash butt welding
(4) Friction welding

Ans: 4

25. The soldering iron is made of

(1) Steel
(2) Stainless steel
(3) Copper
(4) Tin

Ans: 3

26. Acetylene gas is generated from

(1) Calcium
(2) Carbon
(3) Calcium carbide
(4) Calcium chloride

Ans: 3

27. Thermoplastic material are produced by

(1) die casting process
(2) shell moulding process
(3) cold forming process
(4) injection moulding process

Ans: 1

28. In die casting process

(1) any metal cab be cast
(2) any size casting can be prepared
(3) very high production rate is possible
(4)die is cheap

Ans: 3

Die casting is a metal casting process that is characterized by forcing molten metal under high pressure into a mould cavity. The mould cavity is created using two hardened tool steel dies which have been machined into shape and work similarly to an injection mould during the process. Most die castings are made from non-ferrous metals, specifically zinc, copper, aluminium, magnesium, lead, pewter, and tin-based alloys. Depending on the type of metal being cast, a hot- or cold-chamber machine is used.

The casting equipment and the metal dies represent large capital costs and this tends to limit the process to high-volume production. Manufacture of parts using die casting is relatively simple, involving only four main steps, which keeps the incremental cost per item low. It is especially suited for a large quantity of small- to medium-sized castings, which is why die casting produces more castings than any other casting process.[1] Die castings are characterized by a very good surface finish (by casting standards) and dimensional consistency.

https://en.wikipedia.org/wiki/Die_casting

29. Natural sand is used in the moulding sand mainly due to fact that it is

(1) refractory
(2) easily available
(3) cheap
(4) refractory and granular

Ans: 4

Natural moulding sands consist of refractory sand grains associated with clay right from their deposit locations. Such sands often develop good moulding properties with the addition of water. For this reason, naturally occurring sands of this type are used "as mined" and need only be mixed with sufficient water to facilitate moulding

Green Sand

The green sand is the natural sand containing sufficient moisture in it. It is mixture of silica and 15 to 30% clay with about 8% water. Clay and water act as a bonding material to give strength. Molds made from this sand are known as green sand mould.

……..

Natural Sands. It can be used as soon as received from source. It contains binding material (5-20%), water (5-8%) and considerable amount of} organic matter. It can maintain moisture contain for long time. The finishing obtained on natural sand molds is good.} It is cheaper compared to other sands. It has lesser refractoriness. It is employed for casting CI and non-ferrous metals. Molds made of natural sand can be easily repaired. When mixed with Bentonite, the properties of the sand gets improved and it gets properties like Synthetic sand.

http://meteng.iust.ac.ir/files/mateng/divandari_3a69a/files/0000-Divandari-sand.pdf

30. Slag inclusion in casting is a

(1) surface defect
(2) internal defect
(3) superficial defect
(4) none of the three are correct

Ans: 1

31. Casting process is preferred for parts having

(1) few details
(2) many details
(3) no detail
(4) complex/non-symmetrical shape

Ans: 4

32. In drawing operation the metal flows due to

(1)ductility (2) work hardening
(3) plasticity (4) shearing

Ans: 3

33. The principles of motion economy are mostly used while conducting

(1) a method study on an operation
(2) a time study on an operation
(3) a financial appraisal of an operation
(4) a feasibility study of the proposed manufacturing plant

Ans:1

METHOD STUDY

Method study is the process of subjecting work to systematic, critical scrutiny to make it more effective and/or more efficient. It is one of the keys to achieving productivity improvement.

It was originally designed for the analysis and improvement of repetitive manual work but it can be used for all types of activity at all levels of an organisation.

The process is often seen as a linear, described by its main steps of:

- Select (the work to be studied);
- Record (all relevant information about that work);
- Examine (the recorded information);
- Develop (an improved way of doing things);
- Install (the new method as standard practice);
- Maintain (the new standard proactive).

https://www.ims-productivity.com/page.cfm/content/Method-Study/

34. The standard time of an operation while conducting a time study is

(1) mean observed time + allowances
(2) normal time + allowances
(3) mean observed time x rating factor + allowances
(4) normal time x rating factor + allowances

Ans:

Standard time is the amount of time that should be allowed for an average worker to process one work unit using the standard method and working at a normal pace. The standard time includes some additional time, called the contingency allowance, to provide for the worker's personal needs, fatigue, and unavoidable delays during the shift.

…………………

Standard time Calculation time study

Standard time may be defined as the, amount of time required to complete a unit of work: (*a*) under existing working conditions, (*b*) using the specified method and machinery, (*c*) by an operator, able to the work in a proper manner, and (*d*) at a standard pace.

Thus basic constituents of standard time are:

Elemental (observed time).

Performance rating to compensate for difference in pace of working.

Relaxation allowance.

Interference and contingency allowance.

Policy allowance.

https://www.wisdomjobs.com/e-university/production-and-operations-management-tutorial-295/time-study-9661.html

35. The minimum number of teeth on the pinion to operate without interference in standard full height involute teeth gear mechanism with 20° pressure angle is

(1) 14 (2) 12 (3) 18 (4) 32

Ans:

36. The Coriolis component of acceleration is present in

(1) 4-bar mechanisms with 4 turning pairs
(2) shaper mechanism
(3) slider-crank mechanism
(4) Scotch Yoke mechanism

Ans:2

37. The primary purpose of sprue in a casting mould is to

(1) feed the casting at a rate consistent with the rate of solidification
(2) act as a reservoir for molten metal
(3) feed molten metal from the pouring basin to the gate
(4) help feed the casting until all solidification take place
Ans:3

38. Hot rolling of mild steel is carried out

(1) at recrystallization temperature
(2) below recrystallization temperature
(3) above recrystallization temperature
(4) none
Ans:3

39. Which of the following arc welding processes does **not** use consumable electrodes

(1) GMAW
(2) GTAW
(3) Submerged Arc Welding
(4) none of these
Ans:2

40. Trepanning is performed for

(1) finishing a drilled hole
(2) Producing a large hole without drilling
(3) truing a hole for alignment
(4) enlarging a drilled hole
Ans:2

41. The hardness of a grinding wheel is determined by the

(1) hardness of abrasive grains

(2) ability of the bond to retain abrasives

(3) hardness of the bond

(4) ability of the grinding wheel to penetrate the work piece

Ans:2

42. A positive value of Joule-Thomson coefficient of a fluid means

(1) temperature drops during throttling
(2) temperature remains constant during throttling
(3) temperature rises during throttling
(4) none of these
Ans:1

From the first law of thermodynamics, such a process is isenthalpic and one can usefully define a Joule-Thomson coefficient as:

$$\mu_{JT} = (\partial T / \partial P)_H$$

as a measure of the change in temperature which results from a drop in pressure across the constriction.

For most real gases at around ambient conditions, μ is positive—i.e., the temperature falls as it passes through the constriction. For hydrogen and helium, it is negative and the temperature increases. At higher temperatures, for most gases, μ falls and may even become negative, μ can also become negative through application of pressure, even at ambient temperature, but pressures in excess of 200 bar are normally necessary to achieve this.

https://www.thermopedia.com/content/905/

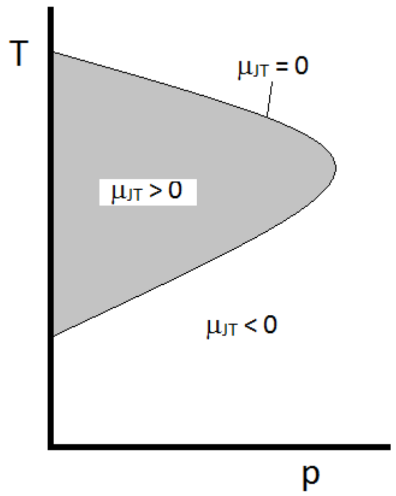


Figure: The typical behaviour of the Joule-Thomson coefficient at different temperatures and pressures. Inside the shaded region, the sample will cool upon expansion. At those p and T conditions outside of the shaded region, the gas will undergo a temperature increase upon expansion. And along the boundary, a gas will undergo neither a temperature increase not decrease upon expansion. For a given pressure, there are typically two temperatures at which μ_{JT} changes sign. These are the upper and lower inversion temperatures.

Not all gases undergo a cooling effect upon expansion. Some gases, such as hydrogen and helium, will experience a warming effect upon expansion under conditions near room temperature and pressure. The direction of temperature change can be determined by measuring the Joule-Thomson coefficient, μ_{JT}. Thi coefficient has the definition

$$\mu_{JT} \equiv \left(\frac{\partial T}{\partial p}\right)_H$$

Schematically, the Joule-Thomson coefficient can be measured by measuring the temperature drop or increase a gas undergoes for a given pressure drop (Figu 4.5.1). The apparatus is insulated so that no heat can be transferred in or out, making the expansion isenthalpic.

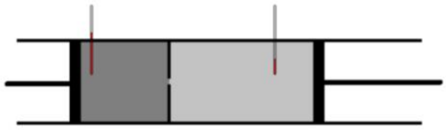


Figure 4.5.1:

https://chem.libretexts.org/Bookshelves/Physical_and_Theoretical_Chemistry_Textbook_Maps/Physical_Chemistry_(Fleming)/04%3A_Putting_the_First_Law_to_Work/4.05%3A_The_Joule-Thomson_Effect

The Joule–Thomson expansion occurs at constant enthalpy through a valve or throttling device

And the Joule–Thomson coefficient $\boldsymbol{\mu}$ is defined as the ratio of the temperature change to the pressure drop, and is expressed in terms of the thermal expansion coefficient and the heat capacity

The Joule–Thomson coefficient will be zero at a point called *inversion point* ($\boldsymbol{T} = 1/\boldsymbol{\beta}$) for all real gases.

Expansion of most real gases causes cooling when the Joule–Thomson coefficient is positive and the gas temperature is below the inversion temperature. However, at atmospheric pressure, as the inversion temperature for hydrogen is low (202K) and hence hydrogen will warm during a Joule–Thomson expansion at room temperature. Since there is no change of temperature when an ideal gas expands through a throttling device, a nonzero Joule–Thomson coefficient refers to a real gas.

https://www.sciencedirect.com/topics/chemistry/joule-thomson-coefficient

43. If there are m physical quantities and n fundamental dimensions in a particular process, the number of non-dimensional parameters is

(1) $m+n$ (2) $m\,xn$ (3) $m-n$ (4) m/n

Ans: C. The non-dimensional groups are called pi-terms. If there are n variables in a dimensionally homogenous equation and if these variables contain m primary dimensions, then the variables can be grouped into (n – m) non dimensional parameter

Process Concept for Scaling-Up and Plant Studies

Govind S. Gupta, ... S. Seetharaman, in Treatise on Process Metallurgy: Industrial Processes, 2014

BUCKINGHAM **Π** THEOREM

Buckingham π theorem (also known as Pi theorem) is used to determine the number of dimensional groups required to describe a phenomena. According to this theorem "the number of dimensionless groups to define a problem equals the total number of variables, n, (like density, viscosity, etc.) minus the fundamental dimensions, p, (like length, time, etc.)." If we call these dimensionless groups π_1, π_2, π_3, etc., then the equation expressing the relationship among the variables has a solution of the form

$F(\pi_1, \pi_2, \pi_{3,\ldots}) = 0$

If in a problem n = 5 and p = 3 then n – p is equal to two and the solution would be either

$F(\pi_1, \pi_2) = 0$

Or

$\pi_1 = f(\pi_2)$

44. If x is the distance measured from the leading edge of a flat plate, the laminar boundary layer thickness varies as

(1) 1/x (2) $x^{4/5}$ (3) x^2 (4) $x^{1/2}$

Ans:4

45. The product of valency and equivalent weight of an element is equal to its

(1) vapour density (2) atomic number

(3) atomic weight (4) molecular weight

Ans:3

46. The mass of 6.023×10^{23} molecules of nitrogen at S.T.P. is:

(1) 28 g (2) 7 g (3) 14 g (4) 42 g

Ans:1

Molecular weight, **also called molecular mass**, mass of a molecule of a substance, based on 12 as the atomic weight of carbon-12. It is calculated in practice by summing the atomic weights of the atoms making up the substance's molecular formula. The molecular weight of a hydrogen molecule (chemical formula H_2) is 2 (after rounding off);

A, E, M AND N ARE THE ATOMIC WEIGHT, EQUIVALENT WEIGHT, MOLECULAR WEIGHT AND VALENCY OF AN ELEMENT. THE CORRECT RELATION IS:

$A = E \times N$

…………………………

Equivalent weight, in chemistry, the quantity of a substance that exactly reacts with, or is equal to the combining value of, an arbitrarily fixed quantity of another substance in a particular reaction. Substances react with each other in stoichiometric, or chemically equivalent, proportions, and a common standard has been adopted. The concept of equivalent weight has been displaced by that of molar mass, which is the mass of one mole of a substance.

The equivalent weight of an element is its gram atomic weight divided by its valence (combining power). Some equivalent weights are: silver (Ag), 107.868 grams (g); magnesium (Mg), 24.312/2 g; aluminum (Al), 26.9815/3 g; and sulfur (S, in forming a sulfide), 32.064/2 g.

For an element, the equivalent weight is the quantity that combines with or replaces 1.008g of hydrogen or 7.9997 g of oxygen; or, the weight of an element that is liberated in an electrolysis (chemical reaction caused by an electric current) by the passage of 1faraday (96,485.3321233 coulombs) of electricity.

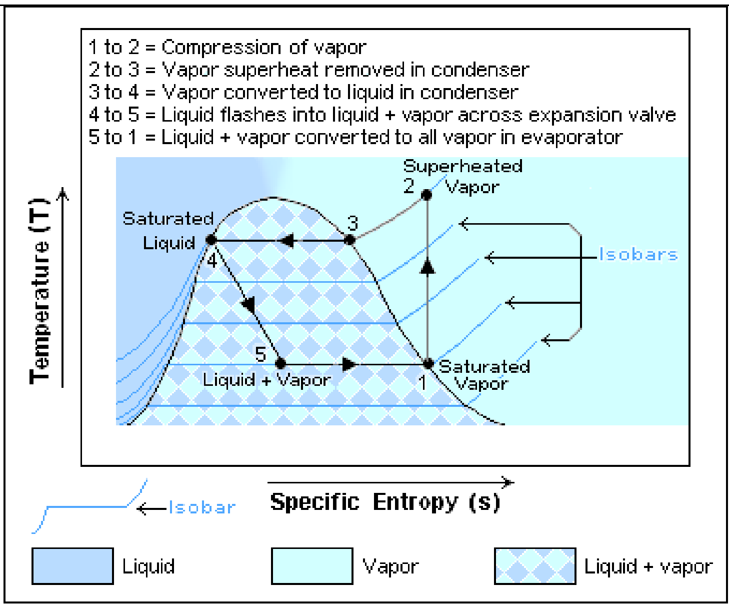
For all oxidizing and reducing agents (elements or compounds), the equivalent weight is the weight of the substance that is associated with the loss or gain of one mole (6.023×10^{23}) of electrons

Britannica, The Editors of Encyclopaedia. "Equivalent weight". ***Encyclopedia Britannica***, 26 Mar. 2021, https://www.britannica.com/science/equivalent-weight. Accessed 17 October 2021.

47. In vapour compression cycle, the condition of refrigerant is saturated vapour

1. After passing through the condenser
2. Before passing through the condenser
3. After passing through the expansion or throttle valve
4. Before entering the compressor

Ans:4



https://en.wikipedia.org/wiki/Vapor-compression_refrigeration#/media/File:RefrigerationTS.png

48. Continuity equation deals with the conservation of

(1) Mass (2) Force

(3) Momentum (4) energy

Ans:1

49. A static load is mounted at the centre of a shaft rotating at uniform angular velocity. This shaft will be designed for

(1) the maximum compressive stress (static)
(2) the maximum tensile stress (static)
(3) the maximum bonding moment (static)
(4) fatigue loading

Ans:4

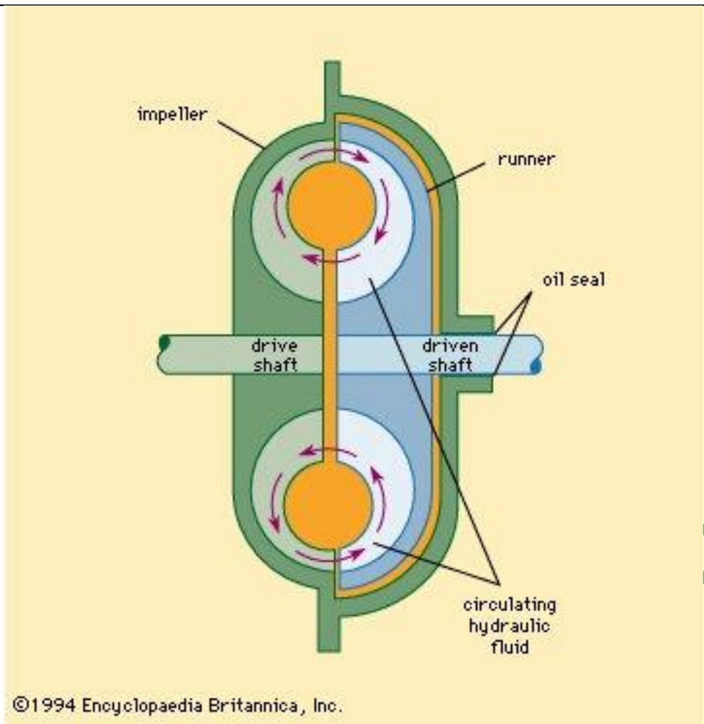
50. Hydraulic transmission.

Hydraulic transmission, device employing a liquid to transmit and modify linear or rotary motion and linear or turning force (torque). There are two main types of hydraulic power transmission systems: hydrokinetic, such as the hydraulic coupling and the hydraulic torque converter, which use the kinetic energy of the liquid; and hydrostatic, which use the pressure energy of the liquid.

The hydraulic coupling is a device that links two rotatable shafts. It consists of a vaned impeller on the drive shaft facing a similarly vaned runner on the driven shaft, both impeller and runner being enclosed in a casing containing a liquid, usually oil (***see*** figure).

The hydraulic torque converter is similar to the hydraulic coupling, with the addition of a stationary vaned member interposed between the runner and the impeller. All three elements are enclosed in a casing containing a liquid, usually oil. A hydraulic torque converter acts like an infinitely variable speed transmission, delivering its higher torques when the output speed is low. In automatic transmissions for automobiles, it can be used as a partial or total substitute for a gearbox and clutch.

Hydraulic transmissions of the hydrostatic type are combinations of hydraulic pumps and motors and are used extensively for machine tools, farm machinery, coal-mining machinery, and printing presses. The motor and pump can be widely separated and connected by piping.



Britannica, The Editors of Encyclopaedia. "Hydraulic transmission". ***Encyclopedia Britannica***, 20 Jul. 1998, https://www.britannica.com/technology/hydraulic-transmission. Accessed 19 October 2021.