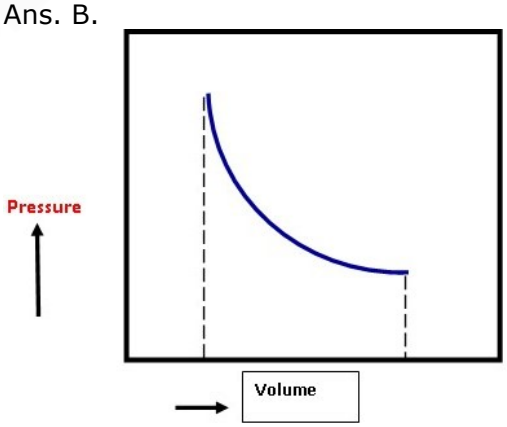
1. According to the Gay-Lussac law for a perfect gas, the absolute pressure of given mass varies directly as
A. temperature
B. absolute temperature
C. absolute temperature, if volume is kept constant
D. volume, if temperature is kept constant
Ans. C.
Gay-Lussac's Laws hows the relationship between the absolute temperature and pressure of a gas. At a fixed volume, the absolute temperature and pressure of a gas are directly proportion to each other.
2. Which of the following can be regarded as gas so that gas laws could be applicable, within the commonly encountered temperature limits.
A. O_2, N_2, steam, CO_2
B. O_2, N_2, water vapour
C. SO_2, NH_3, CO_2, moisture
D. O_2, N_2, H_2, air
Ans. D.
Gases behave in a similar way over a wide variety of conditions because they all have molecules which are widely spaced, and the equation of state for an ideal gas is derived from kinetic theory.
3. Temperature of a gas is produced due to
A. its heating value
B. kinetic energy of molecules
C. repulsion of molecules
D. attraction of molecules
Ans. B.
Kinetic theory defines temperature in its own way, in contrast with the thermodynamic definition and also The kinetic theory describes a gas as a large number of submicroscopic particles (atoms or molecules).
4. The pressure of a gas in terms of its mean kinetic energy per unit volume E is equal to
A. E/3 B. E/2
C. 3E/4 D. 2E/3
Ans. D.
Pressure in terms of kinetic energy per unit volume:- The pressure of a gas is equal to two-third of kinetic energy per unit volume of the gas.
P=2E/3

5. According to Boyle's law for a perfect gas
A. $T_2/T_1 = P_2/P_1$, if V is kept constant
B. $T_2/T_1 = V_2/V_1$, if P is kept constant
C. $P_1/P_2 = V_2/V_1$, if T is kept constant
D. None of these
Ans. C.
Boyle's law states that the pressure of a given mass of an ideal gas is inversely proportional to its volume at a constant temperature.

6. Boyle's law i.e. PV = constant is applicable to gases under
A. all ranges of pressures
B. only small range of pressures
C. high range of pressures
D. steady change of pressures
Ans. B.



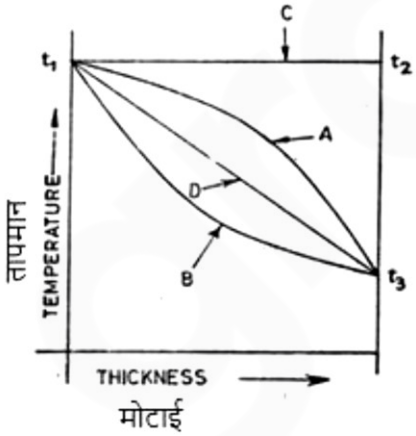
Pv=k,
p denotes the pressure of the system.
V denotes the volume of the gas.
k is a constant value representative of the pressure and volume of the system.
Limitations:
So long as temperature remains constant the same amount of energy given to the system persists throughout its operation and therefore, theoretically, the value of k will remain constant.

7. According to which law, all perfect gases change in volume by $(1/273)^{th}$ of their original volume at 0°C for every 1°C change in temperature when pressure remains constant
A. Joule's law
B. Boyle's law
C. Regnault's law
D. Charles's law
Ans. D.
Charlers law:-It states that volume of a given mass of a gas varies directly a sits absolute temperature, provided its pressure is kept constant.

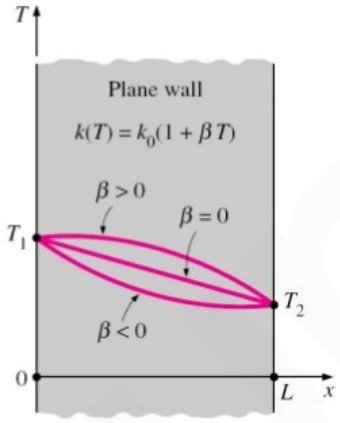
$$\frac{v}{t} = constant$$

$$\frac{V - V_o}{V_o T} = \frac{1}{273} = \gamma_p$$

Here is $\gamma_p = \frac{1}{273}$ is called volume coefficient of gas at constant pressure.
Volume coefficient of a gas, at constant pressure, is defined as the change in volume per unit volume per degree centigrade rise of temperature.
8. In the figure given below, curve A will be applicable when thermal conductivity of the material.

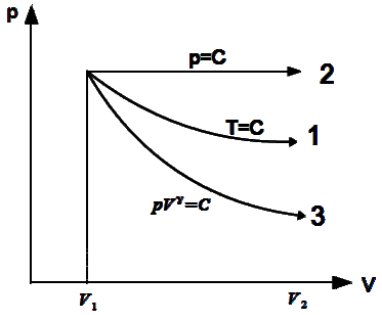


A. increases with increase in temperature
B. decreases with increase in temperature
C. is very large
D. is constant at all the temperatures
Ans. A.
Variable Thernal Conductivity
• For a plane wall the temperature varies linearly during ateady one-dimensional heat conduction when the thermal conductivity is constant.
• This is no longer the case when the thermal conductivity changes with temperature (even linearly).

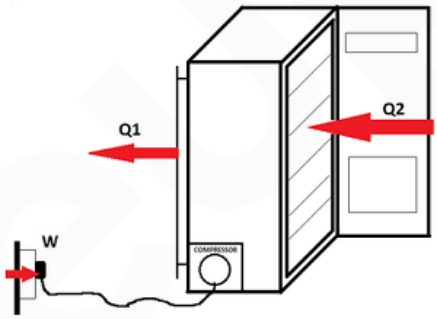


from above graph, option(A) is correct.
9. In order that a cycle be reversible, following must be satisfied
A. free expansion or friction resisted expansion/compression process should not be encountered
B. when heat is being absorbed, temperature of hot source and working substance should be same
C. when heat is being rejected, temperature of cold source and working substance should be same
D. All options are correct
Ans. D.
In thermodynamics, a reversible process is a process whose direction can be "reversed" by inducing infinitesimal changes to some property of the system via its surroundings, with no increase in entropy. Throughout the entire reversible process, the system is in thermodynamic equilibrium with its surroundings.
10. Which of the following parameters remains constant during ideal throttling process
A. pressure B. temperature
C. volume D. enthalpy
Ans. D.
Enthalpy remains constant in throttling process.
11. Maximum work by an expansion of a gas in a closed system is possible when process takes place at constant
A. pressure B. temperature
C. volume D. enthalpy

Ans. A.
If a process W_1 is purely isothermal (constant temperature), W_2 if purely isobaric (constant volume) and W_3 adiabatic, at content volume the work would be zero, then



Area under the curve in a p – V diagram is the work done.
$A_2 > A_1 > A_3$
Where,
A_1 = Area under curve 1
A_2 = Area under curve 2
A_3 = Area under curve 3
From the statement above, we have
W_2, W_1, W_3
12. In an isothermal process, the internal energy
A. increases B. decreases
C. remains constant D. first increases and then decreases
Ans. C
Internal energy is a function of temperature. If temperature is constant then internal energy will also remain constant.
13. Which of the following represents the perpetual motion of the first kind
A. engine with 100% thermal efficiency
B. a full reversible engine
C. transfer of heat energy from low temperature source to high temperature source
D. a machine that continuously creates its own energy
Ans. D.
A perpetual motion machine of the first kind produces work without the input of energy. It thus violates the first law of thermodynamics: the law of conservation of energy.
14. The door of a running refrigerator inside a room was left open. Which of the following statement is correct?
A. The room will be cooled to the temperature inside the refrigerator
B. The room will be cooled slightly
C. The room will be gradually warmed up
D. The temperature of the air in the room will remain unaffected
Ans. C.
So just like any other machine, refrigerator generates heat. When you first open the door you'll get a burst of cold air, but that's about it. It'll cool the room a little, but heat up a lot more. The net result would be an increase in room temperature due to the constantly running motor-heaving energy around in a circle.



As the door open the heat Q2 is absorbed from the entire room instead of just the refrigerator compartment. While the heat Q1 is rejected to the room just as before.
Now we have already know that:
$Q_1 > Q_2$
That is, the heat rejected is more than heat absorbed in the room.
Hence there is a net heat addition in the room and the temperature of room would be increase.
15. A perfect gas at 27°C was heated until its volume was doubled. The temperature of the gas will now
A. 270°C B. 540°C
C. 327°C D. 729°C
Ans. C.
This question can be solved if pressure is assumed to be constant. At constant pressure

$$V \alpha T$$

Hence we get

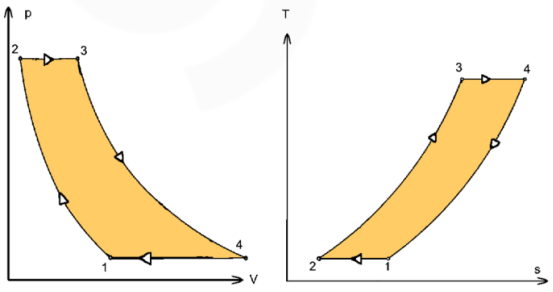
$$\frac{V}{2V} = \frac{273+27}{T}$$

T = 600 K
T = 370o C

16. For same compression ratio and for same heat added
A. Otto cycle is more efficient than Diesel cycle
B. Diesel cycle is more efficient than Otto cycle
C. efficiency depends on other factors
D. both Otto and Diesel cycles are equally efficient
Ans. A.
The Otto air standard cycle is more efficient because the area under the PV diagram is larger. This is due to the heat addition being done at constant volume (analogous to the piston being at TDC compression), while the diesel heat addition is at constant pressure, being analagous to the heat being added while the piston is moving down in the expansion stroke.
17. The efficiency of Diesel cycle with decrease in cut off
A. increases
B. decreases
C. remains unaffected
D. first increases and then decreases
Ans. A.
expression for thermal efficiency

$$\eta_{th} = 1 - \frac{1}{r^{\gamma-1}}\left(\frac{\alpha^{\gamma}-1}{\gamma(\alpha-1)}\right)$$

r is the compression ratio, gamma is the ratio of specific heats, alpha(α) is the cut-off ratio.
18. The ideal efficiency of an Ericsson cycle with perfect regeneration and operating between two given temperature limits is
A. equal to Joule cycle
B. equal to Carnot cycle
C. equal to Brayton cycle
D. less than Carnot cycle
Ans. B.



the Ericsson cycle is an altered version of the Carnot cycle in which the two isentropic processes featured in the Carnot cycle are replaced by two constant-pressure regeneration processes.
19. A steam nozzle coverts _____.
A. kinetic energy into heat
B. heat energy into potential energy
C. potential energy into heat
D. heat energy into kinetic energy
Ans. D.
the steam nozzle is to increase the kinetic energy of the flowing medium at the expense of its pressure and internal energy.
20. Which is the wrong assumption for calculation of air standard efficiency?
A. All processes are reversible
B. Specific heat remains constant at all temperatures
C. No account of the mechanism of heat transfer is considered
D. Gases dissociate at higher temperatures
Ans. D.
Dissociation is a general process in which molecules (or compounds) separate or split into smaller particles such as atoms, ions. For example, when an acid dissolves in water, a covalent bond between an electronegative atom and a hydrogen atom is broken, which gives a proton (H+) and a negative ion.
21. Calculate the enthalpy of 3 kg of fluid that occupies a volume of 1.5 M3, if the internal energy is 3.5 M Joules/kg and the pressure is 0.3 MN/m2
A. 3.95 MJ B. 3.65 MJ
C. 10.95 MJ D. None of these
Ans. D.
Enthalpy is given as
H =U + PV
H = 3.5 x 3 + 0.3 x 1.5
H = 10.95 MJ
Note: In question internal energy per unit kg is given, so it should be multiplied by 3kg. In case if you do not know the formula to be used in certain questions, just try to match the units. I have seen that many questions can be done just by balancing the units.

22. When a process undergoes a complete cycle then the change of entropy will be
A. + ve value B. -ve value
C. zero value D. + ve or – ve value depending on initial condition
Ans. C.
Entropy is a property; hence in a cycle initial and final value remains same.
23. Following relationship defines the Gibb's free energy G
A. G = H + TS B. G = H – TS
C. G = U + TS D. F = U – TS
Ans. B.

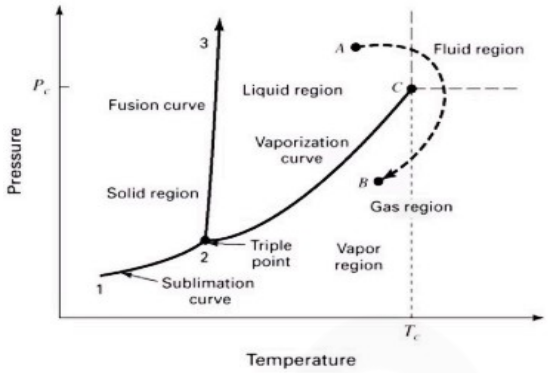
The Gibbs free energy is defined as

$$G(p,T) = U + pV - TS,$$

which is the same as

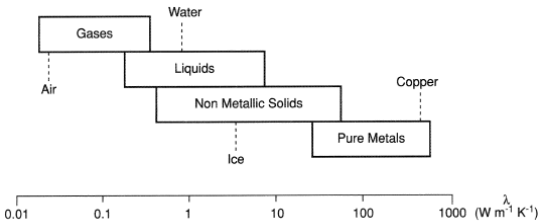
$$G(p,T) = H - TS,$$

24. During a process on the closed system its internal energy increases by twice the units than the heat added to it. It is possible due to
A. radiation of heat from surroundings
B. lowering of the temperature
C. increasing of the temperature
D. performing of shaft work on the system
Ans. D.
We know that
dQ = dU + dW
dU = dQ – dW
where,
heat added to system is (+)
work done on the system is (-)
hence, internal energy would increase twice if work done on system.
25. Fusion curve of p-t diagram for all substances possesses the following slope
A. zero B. infinity
C. positive D. variable
Ans. D.
Fusion curve as been drawn with a positive slope, which is typically the case. Fusion curve of ice/water is very special. It has a negative slope due to the fact that when ice melt, the molar volume decreases. Ice actually melts at lower temperature at higher pressure.

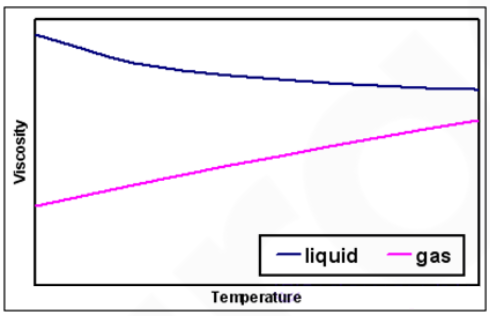


26. When heat is transferred from one particle of hot body to another by actual motion of the heated particles, it is referred to as heat transfer by:
A. conduction
B. convection
C. radiation
D. conduction and convection
Ans. A.
Thermal conduction is the transfer of heat (internal energy) by microscopic collisions of particles and movement of electrons within a body
27. Which of the following is a case of steady state heat transfer?
A. I.C. engine
B. Air preheaters
C. Heating of building in winter
D. None of these
Ans. D.
Under Steady state conditions the temperature within the system does not change with time
28. The time constant of a thermocouple is
A. the time taken to attain the final temperature to be measured
B. the time taken to attain 50% of the value of initial temperature difference
C. the time taken to attain 63.2% of the value of initial temperature difference
D. determined by the time taken to reach 100°C from 0°C
Ans. C.
Time constant of a thermocouple is the time taken to attain 63.2% of the value of initial temperature difference.
29. Which of the following is expected to have highest thermal conductivity?
A. steam B. solid ice
C. melting ice D. water

Ans. B.

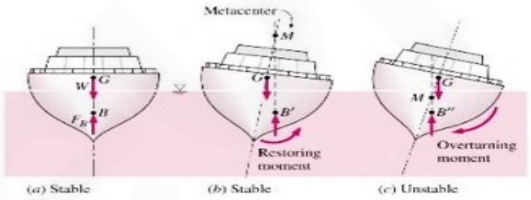


30. The rate of energy emission from unit surface area through unit solid angle, along a normal to the surface, is known as
A. emissivity
B. transmissivity
C. reflectivity
D. intensity of radiation
Ans. D.
Intensity of radiation is a measure of the distribution of radiant heat flux per unit area and solid angle, in a particular direction.
31. Dynamic viscosity of most of the gases with rise in temperature
A. increases
B. decreases
C. remains unaffected
D. unpredictable
Ans. A.



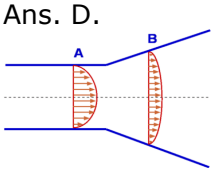
According to the kinetic theory of gases, viscosity should be proportional to the square root of the absolute temperature, in practice, it increases more rapidly.
32. The resultant of all normal pressures acts
A. at c.g. of body
B. at centre of pressure
C. vertically upwards
D. at metacentre
Ans. C.
The center of pressure is the point where the total sum of a pressure field acts on a body, causing a force to act through that point.

33. A body floats in stable equilibrium
A. When its metacentric height is zero
B. when the metacentre is above c.g.
C. when its c.g. is below its centre of buoyancy
D. metacentre has nothing to do with position of c.g. for determining stability
Ans. B.
Stability of Floating Body
a) Stable Equilibrium: If the point M is above G.
b) Unstable Equilibrium: If the point M is Below G.
c) Neutral Equilibrium: If the point M is at the G.

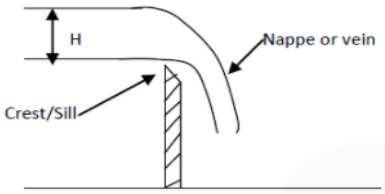


34. Metacentre is the point of intersection of
A. vertical upward force through c.g. of body and center line of body
B. buoyant force and the center line of body
C. mid-point between c.g. and center of buoyancy
D. All of these
Ans. B.
Metacentre, also spelled metacenter, in fluid mechanics, the theoretical point at which an imaginary vertical line passing through the centre of buoyancy and centre of gravity intersects the imaginary vertical line through a new centre of buoyancy created when the body is displaced, or tipped, in the water.
35. The two important forces for a floating body are
A. buoyancy, gravity
B. buoyancy, pressure
C. buoyancy, inertial
D. inertial, gravity
Ans. A.
In a body to float, the weight of the body should be supported by the buoyant force and Gravity is also required

36. The normal stress is same in all directions at a point in a fluid
A. only when the fluid is frictionless
B. only when the fluid is incompressible and has zero viscosity
C. when there is no motion of one fluid layer relative to an adjacent layer
D. irrespective of the motion of one fluid layer relative to an adjacent layer
Ans. C.
frictionless flows is substantially simpler than that of viscous flow and when fluid is frictionless, all normal stress is same.
37. An ideal flow of any fluid must satisfy
A. Pascal law
B. Newton's law of viscosity
C. boundary layer theory
D. continuity equation
Ans. D.
In fluid dynamics, the continuity equation states that the rate at which mass enters a system are equal to the rate at which mass leaves the system plus the accumulation of mass within the system.
38. The flow in which the velocity vector is identical in magnitude and direction at every point, for any given instant, is known as
A. one dimensional flow
B. uniform flow
C. steady flow
D. turbulent flow
Ans. B.
uniform flow is define as flow in which velocity other hydrodynamic parameters do not change at any point.
39. Two dimensional flow occurs when
A. the direction and magnitude of the velocity at all points are identical
B. the velocity of successive fluid particles, at any point, is the same at successive periods of time
C. the magnitude and direction of the velocity do not change from point to point in the fluid
D. the fluid particles move in plane or parallel planes and the streamline patterns are identical in each plane
Ans. D.



40. The upper surface of a weir over which water flows is known as
A. crest B. nappe
C. sill D. weir top
Ans. C.



41. The fluid forces considered in the Navier strokes equation are
A. gravity, pressure and viscous
B. gravity, pressure and turbulent
C. pressure, viscous and turbulent
D. gravity, viscous and turbulent
Ans. A.
force consider in the Navier Stokes equation :-
→ Body forces act on the entire element, rather than merely at its surfaces. The only body force to be considered here is that due to gravity. By convention, gravity acts in the negative z-direction, i.e. downward.
→ Pressure forces act inward and normal to the surfaces of the element, and have been discussed previously.
→ there are viscous forces, due to friction acting on the fluid element because of viscosity in the fluid. These viscous forces are surface forces, like the forces due to pressure, but can act in any direction on the surface. In other words, viscous forces at a surface can have both normal and tangential (or shear) components.
42. Bernoulli equation deals with the law of conservation of
A. Mass B. momentum
C. energy D. work
Ans. C.
According to Bernoulli equation if any fluid is flow than total energy in the fluid will be constant. If viscosity of fluid is zero
43. Specific weight of sea water is more than that of pure water because it contains _____.
A. dissolved air
B. dissolved salt
C. suspended matter
D. All options are correct

Ans. D.
specific weight = ρg
Density(ρ) = is increase with dissolved air, dissolved salt and suspended matter
44. Darcy-Weisabach equation for loss of head in pipe is:-
Where f = friction factor, L = length, V = velocity, m = A/P = area/wetted perimeter
A. f (L/4m).(V2/2g) B. f (L/m)(V2/2g)
C. f (4L/m)(V2/2g) D. f (4m/L)(V2/2g)
Ans. A.
Darcy – Weisabach equation is given as

$$h = \frac{fLV^2}{2gD} = f\left(\frac{L}{D}\right)\left(\frac{V^2}{2g}\right) \qquad (i)$$

It is given that,

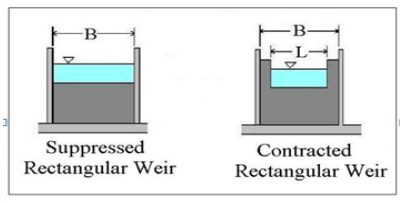
$$m = \frac{A}{P} = \frac{(\pi/4)D^2}{\pi D} = \frac{D}{4}$$

D = 4m
Putting in question (i), we get

$$h = f\left(\frac{L}{4m}\right)\left(\frac{V^2}{2g}\right)$$

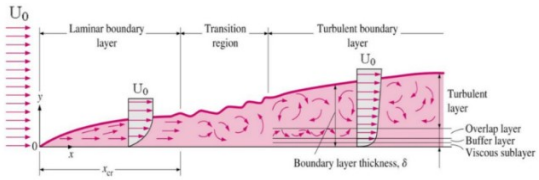
45. A mouthpiece can't be used under very large head because of
A. creation of vortex at vena contracta
B. cavitation problem at vena contracta
C. large variation of discharge
D. erratic flow
Ans. B.
A mouthpiece can't be used under very large head because at vena contracta velocity of flow is very high and pressure will be very less due to this cavitation takes place.
46. For very high discharge at low pressure such as for flood control and irrigation applications, which of the following types of pump is preferred?
A. Centrifugal B. Axial Flow
C. Reciprocating D. Mixed Flow
Ans. B.
axial flow propeller pumps are of rugged, heavy-duty construction designed to operate in a multitude of applications requiring the movement of a high volume of water at a low discharge pressure. They are used extensively for pumping water from sources including lakes, cooling ponds, tanks, rivers and oceans.

47. Time required to empty uniform rectangular tank is proportional to its
A. height H B. √H
C. H2 D. H3/2
Ans. B.
Time(T) = $2A\sqrt{H}/C_d a\sqrt{2g}$
A = area of tank
H = hight of tank
A = area of hole
C_d = discharge coefficient
48. The hydraulic radius in the case of an open channel with great width is equal to
A. depth of channel
B. 1/2 x depth of channel
C. 1/3 x depth of channel
D. 1/4 x depth of channel
Ans. A.
hydraulic radius = area/perimeter
Hight = h and width = w
Hydraulic radius = hw/(h+w)
h+w = w for great width
than, Hydraulic radius = h
49. Runaway speed of a hydraulic turbine is
A. full load speed
B. the speed at which turbine runner will be damaged
C. the speed if the turbine runner is allowed to revolve freely without load and with the wicket gates wide open
D. the speed corresponding to maximum overload permissible
Ans. C.
The runaway speed of a water turbine is its speed at full flow, and no shaft load. The turbine will be designed to survive the mechanical forces of this speed.
50. The cipoletti weir functions as if it were a following notch without end contractions
A. triangular notch
B. trapezoidal notch
C. rectangular notch
D. parallelogram notch
Ans. C.



Sharp Crested Rectangular Weirs

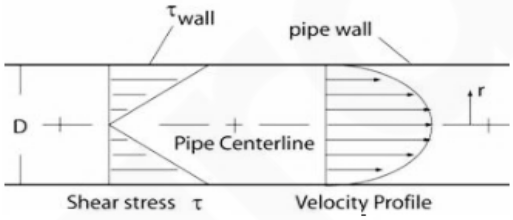
51. The velocity distribution in the turbulent boundary layer follows
A. straight line law
B. parabolic law
C. hyperbolic law
D. logarithmic law or Power law
Ans. D.



52. When a liquid rotates at constant angular velocity about a vertical axis as a right body, the pressure
A. varies as the square of the radial distance
B. decreases as the square of the radial distance
C. increases linearly as the radial distance
D. varies inversely as the elevation along any vertical line
Ans. A.
$P = (1/2)\ \rho R^2\omega^2$
53. The magnitude of water hammer depends on
A. length of pipe
B. elastic properties of pipe material
C. rate of stoppage of flow
D. All options are correct
Ans. D.
Water hammer is a pressure surge or wave caused when a fluid (usually a liquid but sometimes also a gas) in motion is forced to stop or change direction suddenly (momentum change).
54. Power transmitted through a pipe is maximum when the loss of head due to friction is
A. one-half of the total head supplied
B. one-third of the total head supplied
C. one-fourth of the total head supplied
D. equal to the total head supplied
Ans. D./B
$P = \rho gQh$
h= total head – head loss = $H - h_f = H - RQ^2$
where R is hydraulic radius
$P = \rho gQ(H - RQ^2)$ fo maxi. $\frac{dP}{dQ} = 0$
$H - 3\ RQ^2 = 0$
Head loss, $RQ^2 = (1/3)H$

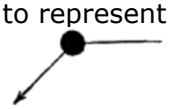
55. To replace a pipe of diameter D by n parallel pipes of diameter d, the formula used is
A. d = D/n B. d = D/n1/2
C. d = D/n3/2 D. d = D/n2/5
Ans. D.
for parallel pipe
$\sqrt{D^5/fl} = \sqrt{d_1^5/fl_1} + \sqrt{d_2^5/fl_2} + \ldots.$
$l = l_1 = l_2 = \ldots$ and $d = d_1 = d_2 = \ldots$
$\sqrt{D^5} = n\sqrt{d^5}$
$D = n^{2/5}d$ or $d = D/n^{2/5}$
56. The total frictional resistance to fluid flow is independent of
A. density of fluid
B. velocity
C. pressure
D. surface roughness
Ans. C.
total frictional resistance = pressure loss×area of pipe wall
$(P_1 - P_2)A = h_f \times \rho gA = (\rho fLV^2/2D)A$
ρ = density, f = surface roughness, v = velocity
57. Which of the following represents unsteady non-uniform flow
A. flow through an expanding tube at an increasing rate
B. flow through an expanding tube at constant rate
C. flow through a long pipe at decreasing rate
D. flow through a long pipe at constant rate
Ans. A.
increasing rate give an idea about unsteady flow while expanding tube (means discharge and area are vary therefore velocity is also vary) give an idea for non-uniform flow.
58. Discharge through a totally submerged orifice is directly proportional to
A. the difference in elevation of water surface
B. the square root of the difference in elevation of water surface
C. the square root of the area of the opening
D. reciprocal of the area of the opening
Ans. B.
$Q = C_cC_{vf}C_{va}A\sqrt{ag(h_1 - h_2)}$
Q = discharge
C_c = coefficient of contraction

C_{vf} = coefficient of velocity caused by friction loss
C_{va} = coefficient to account for exclusion of approach velocity head from the equation
A = the area of the orifice
g = acceleration caused by gravity
h_1 = upstream head
h_2 = downstream head
59. in turbulent flow
A. the shear stresses are generally larger than in a similar laminar flow
B. fluid particles move in an orderly manner
C. momentum transfer is on a molecular scale only
D. cohesion is more effective than momentum transfer is causing shear stress
Ans. A.
Reynolds number is proportional to shear stress and for turbulent flow Reynolds number is larger than laminar flow.
60. The shear stress in a fluid flowing in a round pipe
A. is constant over the cross-section
B. is zero at the wall and increases linearly to the center
C. is zero at the center and varies linearly with radius
D. varies parabolically across the section
Ans. C.

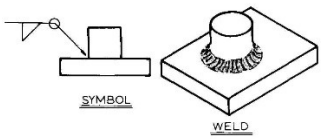


61. The property of a material which enables it to resist fracture due to high impact loads is known as
A. elasticity B. endurance
C. strength D. toughness
Ans. D.
toughness is the ability of a material to absorb energy and plastically deform without fracturing.
62. Resilience of a material is important, when it is subjected to
A. combined loading B. fatigue
C. thermal stresses D. shock loading
Ans. D.
resilience is the ability of a material to absorb energy when it is deformed elastically, and release that energy upon unloading if shock load is heavy than resilience will be more.
63. Which of the following is not the correct procedure to increase the fatigue limit
A. cold working
B. shot peening
C. surface decarburization
D. under-stressing
Ans. C.
Decarburization is the process which reduction of carbon content.
64. The rivet head for boiler applications shown in the figure given below is:-

A. snap B. pan
C. conical D. steeple
Ans. D.
a rivet having a head in the form of a cylindrical cone.
65. The drawing representation shown in the figure given below for welding is used to represent.



A. field weld B. weld all around
C. flush contour D. chipping finish
Ans. B.



66. A key made from a cylindrical disc having segmental cross-section, is known as
A. wood-ruff key B. feather key
C. flat saddle key D. gib head key
Ans. A.
Wood-ruff key

67. A bench vice has following type of threads
A. metric B. buttress
C. acme D. square
Ans. D.

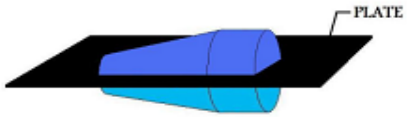
Bench vice with square thread

68. The function of cutting oil when threading a pipe is to
A. provide cooling action
B. lubricate the dies
C. help remove chips
D. All options are correct
Ans. D.
Cutting fluid is a type of coolant and lubricant designed specifically for metalworking processes, such as machining and stamping.
69. Aircraft body is usually fabricated by
A. welding B. precasting
C. riveting D. casting
Ans. C.
there is many reason due to this Aircraft body is usually fabricated by riveting these are cost, fatigue, easy to repair high temperature, weight.
70. Which is a correct statement about flexibility and endurance of ropes?
A. lang lay rope is more flexible and endurable than regular lay rope
B. regular lay rope is more flexible and endurable than lang lay rope
C. both are equally good
D. other factors decide these considerations
Ans. A.
For the same size and construction, ropes having the same wire sizes and lays, Lang Lay Ropes are somewhat more flexible than Regular Lay and have several times the wearing surface per wire to resist abrasion

71. In arc welding, eyes need to be protected against:-
A. intense glare
B. sparks
C. infra-red rays only
D. both infra-red rays and ultraviolet rays
Ans. D.

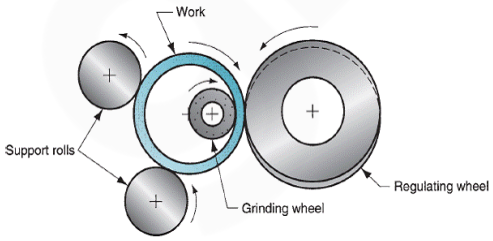
72. The main criterion for selection of electrode diameter in arc welding is:-
A. materials to be welded
B. type of welding process
C. thickness of material
D. voltage used
Ans. C.
electrode diameter is increase with increase thickness of material
73. Open circuit voltage for arc welding is of the order of:
A. 18 – 40 volts
B. 40 – 95 volts
C. 100 – 125 volts
D. 130 – 170 volts
Ans. B.
Arc welding involves open circuit voltages which are typically from as low as 20 volts to as high as 100 volts.
74. Which of the following is not a casting defect?
A. hot tear B. blow hole
C. scab D. decarburization
Ans. D.
Decarburization is the process which reduction of carbon content.
Decarburization occurs when the metal is heated to temperatures of 700 °C or above when carbon in the metal reacts with gases containing oxygen or hydrogen.

75. The chief advantage of die casting is:-
A. possibility of incorporating thick sections in small castings
B. casting of inserts is possible
C. wide tolerances are possible
D. high production rates are possible
Ans. D.
high production rates are possible because in die casting there is no any need to concern about mould cavity which is not make by sand.
76. For mounting several patterns at a time, which of the following type of pattern is used?
A. combined pattern
B. loose, piece pattern
C. sweep pattern
D. match plate pattern
Ans. D.

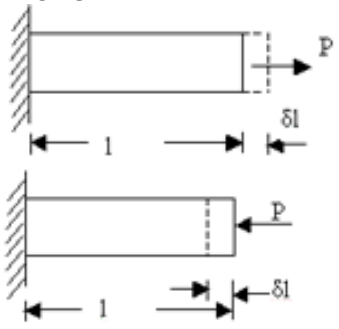


MATCH PLATE PATTERN

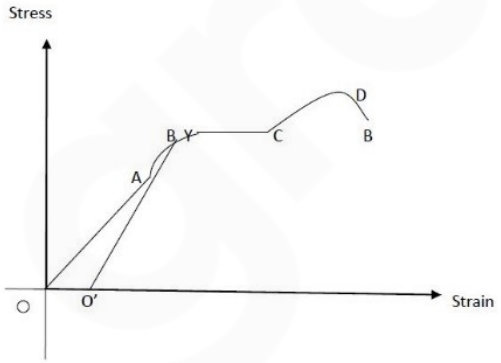
77. Casting process is preferred for parts having _____.
A. a few details
B. many details
C. no details
D. non-symmetrical shape
Ans. B.
To make pattern more number of details are required.
78. Holes in parts which have been hardened by heat treatment can be finished to accurate size only
A. drilling B. boring
C. internal grinding D. reaming
Ans. C.



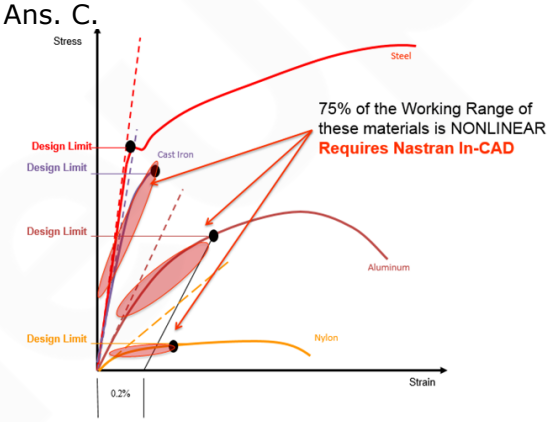
79. A grinding wheel gets glazed due to:-
A. wear of abrasive grains
B. wear of bond
C. breaking of abrasives
D. cracks in wheel
Ans. A.
After frequent use the wheel becomes dull or glazed. By glazing we mean a condition of wheel in which the face of cutting edge takes a glass like appearance.
80. Which of the following is the not a natural abrasive?
A. Garnet
B. Emery
C. Borron-carbide
D. Corundum
Ans. C.
The materials used to make abrasives can be broadly classified as either natural or synthetic.
Natural abrasives include diamond, Garnet, corundum, and emery; they occur in natural deposits and can be mined and processed for use with little alteration.
Synthetic abrasives, on the other hand, are the product of considerable processing of raw materials or chemical precursors; they include silicon carbide, borron carbide, synthetic diamond.
Most natural abrasives have been replaced by synthetic materials because nearly all industrial applications demand consistent properties. With the exception of natural diamond, most of nature's abrasives are too variable in their properties.
81. Hooke's law holds good upto:-
A. yield point
B. limit of proportionality
C. breaking point
D. elastic limit
Ans. B.
It is valid upto limit of proportionality and not upto yield point, it's a common mistake done by students.
82. Deformation per unit length in the direction of force is known as:-
A. strain B. lateral strain
C. linear strain D. linear stress
Ans. C.



83. A thin mild steel wire is loaded by adding loads in equal increments till it breaks. The extensions noted with increasing loads will behave as under:
A. uniform throughout
B. increase uniformly
C. first increase and then decrease
D. increase uniformly first and then increase rapidly
Ans. D.
If we continuously load the wire and plot the graph of stress vs strain, the graph would be as shown in fig. we form 4 regions here.
Region OA: In this region stress is directly proportional to strain, i.e. Hookes law is obeyed in this region. this region is elastic region.the stress corresponding to point A is called as the elastic limit.
Region AB: in this region small increase in stress causes large increase in strain. This region is partly elastic and partly plastic.if we remove the load from any point between A toB ,wire takes the path BO'.
Region beyond Y: the point Y is called as yield point. Beyond Y strain begins to increase without change in stress.and wire is said to be flow. here formation of neck takes place.
Region CDB: this region is plastic in nature.the stress corresponding to point D is called as ultimate stress. Wire becomes thin and thin in this region. If we still load the wire,it breakes

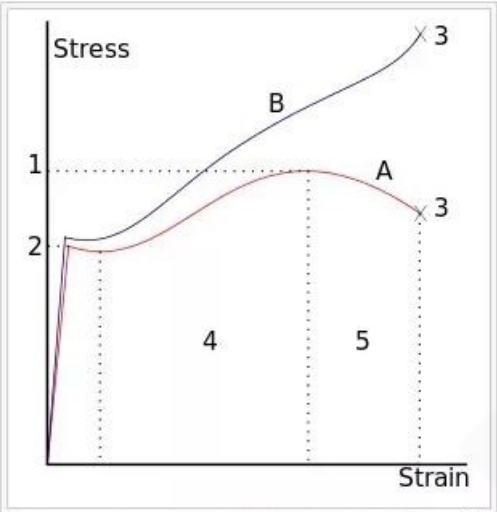


84. Tensile strength of a material is obtained by dividing the maximum load during the test by the :-
A. area at the time of fracture
B. original cross-sectional area
C. the time of fracture and original cross-sectional area
D. minimum area after fracture
Ans. B.
The tensile test measures the resistance of a material to a static or slowly applied force.
UTS, The ultimate tensile strength (UTS) is the maximum resistance to fracture. It is equivalent to the maximum load that can be carried by one square inch of cross-sectional area when the loads applied as simple tension.
85. Percentage reduction of area in performing tensile test on cast iron may be of the order of:-
A. 50% B. 25%
C. 0% D. 15%
Ans. C.



86. For steel, the ultimate strength in shear as compared to in tension is nearly:-
A. same B. half
C. one-third D. two-third
Ans. B.
it comes from maximum shear stress theory.
For 100% shear forces acting and no tensile forces acting then it's half of the value of ultimate stress in the tensile.
87. In a tensile test on mild steel specimen, the breaking stress as compared to ultimate tensile stress is:-
A. more
B. less
C. same
D. more/less depending on composition
Ans. B.
The true stress (sometimes called scientific stress) is defined as the force divided by the smallest cross sectional area as the sample necks down when you stretch it. The true stress keeps going up as you stretch the material towards

ultimate failure. The engineering stress uses the original full area for convenience in calculation. It's just that as the force is increasing, you are still dividing by the original full area even though the real area is decreasing. That is why you see the plotted value of stress decreasing towards ultimate failure.



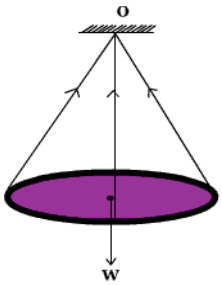
A **stress–strain curve** typical of structural steel.

1: Ultimate strength
2: Yield strength (yield point)
3: Rupture
4: Strain hardening region
5: Necking region

88. If a part is constrained to move and heated, it will develop
A. principal stress
B. tensile stress
C. compressive stress
D. shear stress
Ans. C.
Whenever a body is heated it expands and when allowed to cool it normally contracts. Its the natural behaviour of material. Hence compressive stress is the right answer.
89. The materials which exhibit the same elastic properties in all directions are called:-
A. homogenous B. inelastic
C. isotropic D. isentropic
Ans. C.
isotropic material means a material having identical values of a property in all directions.

90. Poisson's ratio is defined as the ratio of _____.
A. longitudinal stress & longitudinal strain
B. longitudinal stress and lateral stress
C. lateral stress and longitudinal stress
D. lateral stress and lateral strain
Ans. C.
Poisson's of ratio is the ratio of lateral strain to longitudinal strain.
or, the ratio of the proportional decrease in a lateral measurement to the proportional increase in length in a sample of material that is elastically stretched.
91. The interface or undercutting in involute gears can be avoided by:-
A. varying the centre distance by changing pressure angle
B. using modified involute or composite system
C. increasing the addendum of small wheel and reducing it for the larger wheel
D. All options are correct
Ans. D.
When both driving gear and driven gear meshes, two types of stresses occur. One is the contact stress due to compression and other is the bending stress due to tension. Bending stress is occurred at the root section of the gear tooth due to tension. Due to which the root portion of the gear tooth gets damaged. This damage of root portion is called undercutting. This is basically caused for less than 17 no of teeth 20 degree pressure angle full depth teeth. And also less than 23 no of teeth for 14.5 degree pressure angle full depth teeth and also Undercutting can be avoided if the no of teeth on the gear is increased or by increasing the thickness of the tooth.
92. In reciprocating engines, primary forces _____.
A. are completely balanced
B. are partially balanced
C. cannot be balanced
D. are balanced by secondary forces
Ans. B.
When a piston passes through TDC and BDC, the change of direction produces an inertia force due to which the piston tends to move in the direction in which it was moving before the change. This force, called the primary force

93. The forces which meet at one point and have their lines of action in different planes are called _____.
A. coplanar non-concurrent forces
B. non-coplanar concurrent forces
C. non-coplanar non-concurrent forces
D. intersecting forces
Ans. B.
Non-coplanar concurrent forces: In this system, all forces do not lie in the same plane, but their line of action passes through a single point.
For example, if a disc of weight W is suspended by means of three strings, line of action of all the forces pass through point 0. The forces do not lie in a plane.



94. Swaying couple results due to:-
A. primary disturbing force
B. secondary disturbing force
C. partial balancing
D. use of two cylinders
Ans. A.
Swaying couple is the couple which tends to make the leading wheels sway from side to side, produced due to separation of unbalanced primary forces along the line of stroke by some distance.
95. In order to balance the reciprocating masses:-
A. primary & secondary forces must be balanced
B. primary couple must be balanced
C. secondary couple must be balanced
D. All options are correct
Ans. D.
the purpose of balancing the reciprocating masses is to eliminate the shaking force and a shaking couple. In most of the mechanisms, we can reduce the shaking force and a shaking couple by adding appropriate balancing mass.

The expression ($m.\omega^2.r\cos\theta$) is known as primary unbalanced force and

$$\left(m.\omega^2.r\times\frac{\cos 2\theta}{n}\right)$$

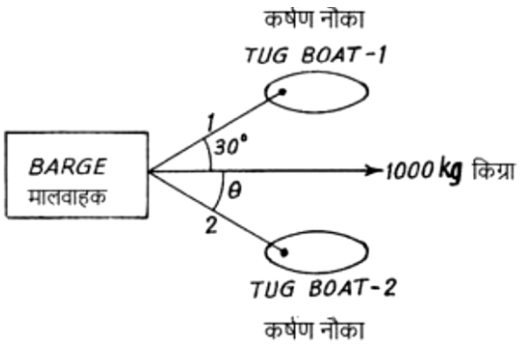
is called secondary unbalanced force.
6. If a body is transmitting torque T N-m at N rpm, then horsepower (Watts) transmitted will be:-
A. TN B. TN/75
C. 2πTN/4500 D. 2πNT/75
Ans. D./C
1 HP = 746 W
Work done per minute = (Force) × (Distance)
= (Average torque) × (Angular displacement)
= T × 2πN/60

$\therefore$ Power, P = $\frac{2\pi NT}{60}$ watts

Also P = Tω

Where ω = $\frac{2\pi N}{60}$

97. A barge is pulled by two tugboats as shown in the figure below. The resultant of forces exerted by the tugboats is 1000 kg force. What will be the value of θ so that tension in rope 2 is minimum?



A. 30° B. 45°
C. 60° D. 0°
Ans. C.
Equating vertical forces, we have
$T_1 \sin 30 = T_2 \sin \theta$
$T_1 = 2T_2 \sin \theta$ (I)
Equating horizontal forces, we have
$T_1 \cos 30 + T_2 \cos \theta = 1000 \times 9.8N$
Note: 1kgf = 9.8 N $2T_2 \sin \theta \cos 30 + T_2 \cos \theta = 9800$ N

$$T_2 \frac{9800}{\sqrt{3}\sin\theta + \cos\theta}$$

For T_2 to be minimum $\sqrt{3}\sin\theta + \cos\theta$ should be maximum, let it be equal to F

$$F = \sqrt{3}\sin\theta + \cos\theta$$

Differentiating it, we get

$$\frac{dF}{d\theta} = \sqrt{3}\cos\theta - \sin\theta = 0$$

$$\frac{\sin\theta}{\cos\theta} = \tan\theta = \sqrt{3}$$

$$\theta = 60^o$$

8. An elevator weighing 1000kg attains an upward velocity of 4 m/sec in two seconds with uniform acceleration. The tension in the supporting cables will be:-

A. 1000 N B. 800 N
C. 1200 N D. None of these
Ans. C.

Acceleration is given as

$$a = \frac{4-0}{2} = 2m/s^2$$

Tension is given as

T = mg + ma = m(g+a)
T = 1000(10+2)
T = 12000 N

99. A 13 m ladder is placed against a smooth vertical wall with its lower end 5 m from the wall. What should be the coefficient of friction between the ladder and floor so that it remains in equilibrium?

A. 0.1 B. 0.15
C. 0.28 D. None of these
Ans. D.

Without knowing the weight of the ladder, coefficient of friction between the ladder and floor can not be found. This question has insufficient data, although official answer given is (D)

100. A particle while sliding down a smooth plane of $19.86\sqrt{2}$ m length acquires a velocity of 19.86 m/sec. The inclination of plane is:

A. 30° B. 45°
C. 60° D. 75°
Ans. B.

Acceleration of the particle along the inclined surface is g sin θ, using the equation of motion, we get

$V^2 = U^2 + 2as$

$19.86^2 = 0^2 + 2 \times g \sin\theta \times 19.86\sqrt{2}$
$7.021 = 9.8 \times \sin\theta$
$\sin\theta = 0.716$
$\theta = 45.76°$