1. Superheated vapour behaves

1. Exactly as a gas
2. As steam
1. As ordinary vapour
4. Approximately as a gas

Ans: 4

2. The equation $\left(P+\frac{an^2}{V^2}\right)(V-nb)=nRT$ is known as

1. Real gas equation
2. Maxwell's equation
3. Vander Waal's equation
4. Avogadro's equation

Ans:3

Vander Waal's equation

$$\left(P+\frac{an^2}{V^2}\right)(V-nb)=nRT$$

$$\left(P+a\left(\frac{n^2}{V}\right)\right)\left(\frac{V}{n}-b\right)=RT$$

where P is the pressure, V is the volume, R is the universal gas constant, and T is the absolute temperature and n is number of moles. The constants *a* and *b* represent the magnitude of intermolecular attraction and excluded volume respectively, and are specific to a particular gas.

The constants *a* and *b* have positive values and are specific to each gas. The term involving the constant *a* corrects for intermolecular attraction. Attractive forces between molecules decrease the pressure of a real gas, slowing the molecules and reducing collisions with the walls. The higher the value of *a*, the greater the attraction between molecules and the more easily the gas will compress.

https://courses.lumenlearning.com/introchem/chapter/van-der-waals-equation/

- Boundless Chemistry. **Provided by**: Boundless Learning. **Located at**: https://www.boundless.com/chemistry/textbooks/boundless-chemistry-textbook/. **License**: *CC BY-SA: Attribution-ShareAlike*

3. An open system is one in which

1. Mass does not cross the boundary but energy may do so
2. Neither mass nor energy cross the boundary of the system
3. Both energy and mass cross the boundary of the system
4. Mass crosses the boundary but not the energy

Ans: 3

4. If a gas is heated against a pressure, keeping the volume constant, work done will be equal to

1. +ve 2. –ve 3. Zero 4. Pressure x volume

Ans: 3 (Work done = Pdv since dv=0.)

5. Work done in an adiabatic process between a given pair of end status depends on

1. The end states only 2. The particular adiabatic process
3. The value of Index "n" 4. None of these

Ans: 4

An adiabatic process is one in which no heat is gained or lost by the system. For example, a**diabatic compressions** actually occur in the cylinders of a car, where the compressions of the gas-air mixture take place so quickly that there is no time for the mixture to exchange heat with its environment. Because work is done on the mixture during the compression, its temperature does rise significantly which helps to ignite the fuel once fuel is injected in to the cylinder at high pressure:

Work done, $W=nR/(1-\gamma)(T_1-T_2)$

6. Work done is zero for the following process

1. Constant volume 2. Free expansion
3. Throttling 4. All of the above

Ans: 4

7. Practically all engineering processes are

1. Quasi static 2. In thermodynamic equilibrium
3. Reversible 4. Irreversible

Ans: 4

8. Steady flow system work is determined by the expression

1. $\int_1^2 pdv$ 2. $-\int_1^2 vdp$ 3. $-\int_1^2 pdv$ 4. $\int_1^2 vdp$

Ans: 2

9. If a heat engine attains 100% thermal efficiency, it violates

1. Zeroth law of thermodynamics
2. First law of thermodynamics

3. Second law of thermodynamics
4. Law of conservation of energy

Ans: 3

10. Reversed Joule cycle is called

1. Carnot cycle
2. Rankin cycle
3. Brayton cycle
4. Bell-Coleman cycle

Ans: 4

Reversed Joule cycle is also known as **Reversed Brayton cycle or Bell Coleman cycle**. The working fluid of the Bell Coleman refrigeration cycle is air. This system of refrigeration is used for Air-craft refrigeration

11. One kw.hr of energy is equal to ……($3.6x10^6$J or 3600 KJ or 3.6 MJ)

One kilowatt-hour (1 kWh) is equivalent to a power of 1 kW being used for 1 hour. 1 k W h = l kilowatt × 1 hour = 1000 watt × 3600 second = **3,600,000 watt-second** or J

12. The major energy loss in steam generating systems is due to the following

1. Unburnt Carbon in ash
2. Incomplete combustion of fuel
3. Ash content of coal
4. Flue gases

Ans: 4

13. Supercharging is the process

1. Supplying the intake of an engine with air at a density greater than the density of atmospheric air
2. Providing forced cooling air
3. Injecting excess fuel
4. Supply compressed air to remove combustion products

Ans: 1

14. A 75 cc engine has following parameter as 75 cc

1. Fuel tank capacity
2. Lub. Oil capacity
3. Swept volume
4. Cylinder volume

Ans: 3

15. The size of inlet valve of an engine in comparison to exhaust valve is

1. Larger
2. small
3. Same
4. Depends on capacity of engine

Ans:1

16. The function of a distributor in a SI engine is to
    1. Distribute charge equally to all cylinders
    2. Regulate power
    3. Feed lub. oil of all moving parts
    4. Tune the spark

Ans: 1

- 
- https://commons.wikimedia.org/wiki/File:Spinterogeno.JPG
- A **distributor** is an enclosed rotating shaft used in spark-ignition internal combustion engines that have mechanically timed ignition. The distributor's main function is to route secondary, or high voltage, current from the ignition coil to the spark plugs in the correct firing order, and for the correct amount of time. Except in magneto systems and many modern computer controlled engines that use crank angle/position sensors, the distributor also houses a mechanical or inductive breaker switch to open and close the ignition coil's primary circuit.
- https://en.wikipedia.org/wiki/Distributor

17. In petrol engines advancing the spark tuning will
    1. Increase the knocking tendency

2. Decrease the knocking tendency
3. Not affect the knocking tendency
4. Increase or decrease the knocking tendency depending on strength and time of spark

Ans: 1

18. If petrol is used in a diesel engine, then
1. Higher knocking will occur
2. Efficiency will be low
3. Low power will be produced
4. Lot of fuel will remain unburnt

Ans: 2

19. Which of the following does not relate to S.I. engine?
1. Ignition coil
2. Distributor
3. Spark plug
4. Fuel injector

Ans: 4

20. Four wheel drive implies
1. Vehicle as four wheels
2. All the wheels are powered
3. All the four wheels can be steered
4. Roar of the vehicle as four wheels

Ans: 2

Note: 4WD is a feature in which the engine's power is transmitted to all four wheels. In two-wheel drive systems, power is only supplied to one set of wheels & either the two in front or the two at the rear. This betters handling and control over the vehicle immensely.

21. The latent heat of steam with increase of pressure
1. Remains same
2. Increase
3. Decreases
4. Behaves unpredictably

Ans: 2

22. Feed water conditioning in thermal power plants is done to
1. Reduce hardness and for removal of total dissolved solids (TDS)
2. Increase efficiency of thermal power plant
3. Increase heat transfer rate
4. Increase steam parameters

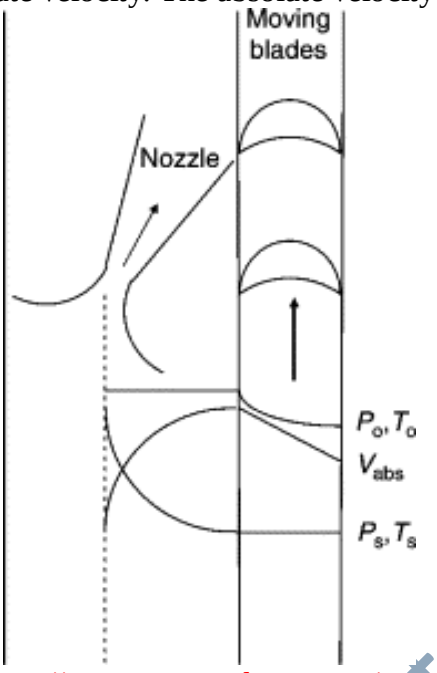
Ans: 1

23. Pick up the correct statement about the change of parameters in an impulse turbine

1. Velocity increases
2. Pressure reduces
3. Both pressure and velocity increase
4. Velocity decreases

Ans: 4

The following figure shows a diagram of a single-stage impulse turbine. The static pressure decreases in the nozzle with a corresponding increase in the absolute velocity. The absolute velocity is then reduced in the rotor.



https://www.sciencedirect.com/topics/engineering/impulse-turbine

24. Bleeding in turbines means
    1. Leakage of steam
    2. Steam using no useful work
    3. Extracting steam for preheating feed water
    4. Removal of condensed steam

    Ans: 3

25. A nozzle is said to be choked when
    1. Flow through it is zero
    2. Flow is attained maximum value corresponding to critical exit pressure
    3. It is discharging into atmospheric pressure
    4. It is plugged

    Ans: 2

26. Intercooling in compressors
    1. Cools the delivered air

2. Results in saving of power in compression
3. Is the standard practice for larger compressors
4. Enables compression in two stages

Ans: 2

27. The ratio of diameters of LP. cylinder to HP cylinder $(D_1/D_2)$with complete intercooling is equal to the pressure ratio..

1. $\frac{P_1}{P_2}$ 2. $\frac{P_2}{P_1}$ 3. $\sqrt{\frac{P_2}{P_1}}$ 4. $\sqrt{\frac{P_1}{P_2}}$

Ans: 3

28. In an impulse turbine the expansion of steam takes place

1. In the nozzles
2. In the blades
3. Partially in the nozzles and partially in the moving blades
4. Neither in the nozzles nor in the blades

Ans: 1

29. The time constant of a thermocouple is

1. The time taken to attain the final temperature to be measured
2. The time taken to attain 50% of the value of initial temp. difference
3. The time taken to attain 63.2% of the value of initial temp. difference
4. Determined by the time taken to reach 100°C to 0°C

Time Constant

The Time Constant of a thermocouple is defined as the time required for the sensor to respond to 63.2% of its total output signal when subjected to a step change in temperature.

Response Time

The Time Constant of a thermocouple is not the same as the Response Time. When someone wants to know the Response Time of a thermocouple, they really want to know how long it takes the thermocouple to reach its full output. Five Time Constants are required for the thermocouple to respond to 99.3% of the total step change temperature.

https://www.hgsind.com/blog/understanding-thermocouple-time-constants-response-times#:~:text=The%20Time%20Constant%20of%20a,a%20step%20change%20in%20temperature.

30. According to Stefan-Boltzmann's law, the total radiation from a black body per sec. per unit area is proportional to….. temperature in Kelvin

1. Absolute temperature (T) 2. T^2 3. T^3 4. T^4

Ans: 4

Emissive power of black bodies as per Stefan-Boltzmann law: $E = \sigma T^4$
Stefan-Boltzmann law, statement that the total radiant heat power emitted from a surface is proportional to the fourth power of its absolute temperature. Formulated in 1879 by Austrian physicist Josef Stefan as a result of his experimental studies, the same law was derived in 1884 by Austrian physicist Ludwig Boltzmann from thermodynamic considerations: if ***E*** is the radiant heat energy emitted from a unit area in one second (that is, the power from a unit area) and ***T*** is the absolute temperature (in kelvins), then

$$\boldsymbol{E} = \sigma \boldsymbol{T}^4,$$

where σ representing the constant of proportionality, called the Stefan-Boltzmann constant. This constant has the value $5.670374419 \times 10^{-8}$ watt per metre^2 per K^4. The law applies only to blackbodies, theoretical surfaces that absorb all incident heat radiation.

Britannica, The Editors of Encyclopaedia. "Stefan-Boltzmann law". ***Encyclopedia Britannica***, 29 Jul. 2019, https://www.britannica.com/science/Stefan-Boltzmann-law. Accessed 20 February 2022.

31. An non-dimensional number generally associated with natural convection heat transfer is

1. Grashoff number 2. Nusselt number
3. Reynold number 4. Weber number

Ans: 1

32. In the heat flow equation $Q = \frac{kA\,(t_1 - t_2)}{x}$, the term $\frac{x}{KA}$ is known as

1. Thermal resistance 2. Thermal coefficient
3. Temperature gradient 4. Thermal conductivity

Ans: 1

(contd)

THERMAL CONDUCTIVITY (K-VALUE). THERMAL CONDUCTIVITY IS THE TIME RATE OF STEADY-STATE HEAT FLOW THROUGH A UNIT AREA OF A HOMOGENEOUS

MATERIAL INDUCED BY A UNIT TEMPERATURE GRADIENT IN A DIRECTION PERPENDICULAR TO THAT UNIT AREA, W/M·K.

$$k = q\frac{L}{\Delta T}$$

where,

L – Thickness of the specimen (m)
T – Temperature (K)
q – Heat flow rate (W/m2)
Equation 1 – Thermal Conductivity

THERMAL RESISTANCE (R-VALUE). THERMAL RESISTANCE IS THE TEMPERATURE DIFFERENCE, AT STEADY STATE, BETWEEN TWO DEFINED SURFACES OF A MATERIAL OR CONSTRUCTION THAT INDUCES A UNIT HEAT FLOW RATE THROUGH A UNIT AREA, K·M2/W. ACCORDING TO THIS DEFINITION AND EQUATION 1, EQUATION 2, THEREFORE, CAN BE OBTAINED.

$$R = \frac{\Delta T}{q} = \frac{L}{k}$$

Equation 2 – Thermal Resistance

As indicated in Equation 2, the value of the thermal resistance can be determined by dividing the thickness with thermal conductivity of the specimen.

THERMAL CONDUCTANCE.THERMAL CONDUCTANCE IS THE TIME RATE OF STEADY STATE HEAT FLOW THROUGH A UNIT AREA OF A MATERIAL OR CONSTRUCTION INDUCED BY A UNIT TEMPERATURE DIFFERENCE BETWEEN THE BODY SURFACES, IN W/M2·K. C-VALUE, HENCE, IS THE RECIPROCAL OF THE R-VALUE AND CAN BE EXPRESSED AS EQUATION (3). CONSEQUENTLY, THE VALUE OF THE THERMAL CONDUCTANCE CAN BE CALCULATED BY DIVIDING THE THERMAL CONDUCTIVITY WITH THE THICKNESS OF THE SPECIMEN.

$$C = \frac{q}{\Delta T} = \frac{1}{R} = \frac{k}{L}$$

Equation 3 – Thermal Conductance

https://ctherm.com/resources/helpful-links-tools/thermalresistanceandconductivity/

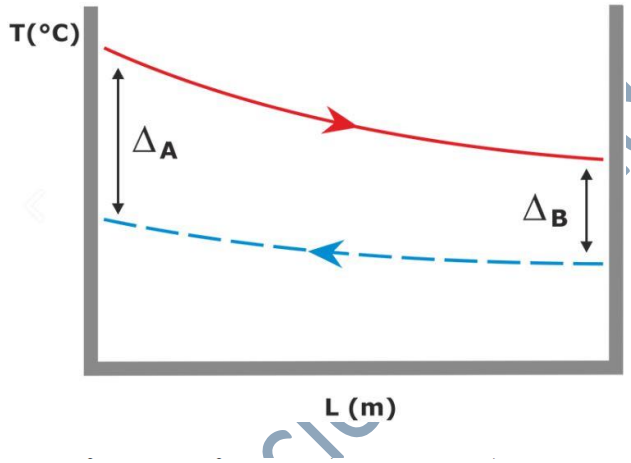
33. Log-mean temperature difference in case of counter flow compared to parallel flow will be

1. Same 2. More 3. Less 4. Depends on others factors

Ans: 2

LOGARITHMIC MEAN TEMPERATURE DIFFERENCE – LMTD

In order to solve certain heat exchanger problems, **engineers** often use a **logarithmic mean temperature difference (LMTD)**, which is used to determine the temperature driving force for heat transfer in heat exchangers. **LMTD** is introduced due to the fact, the temperature change that takes place across the heat exchanger from the entrance to the exit is **not linear**. It is calculated using the following equation -



$$LMTD = \frac{\Delta T_A - \Delta T_B}{\ln\left(\frac{\Delta T_A}{\Delta T_B}\right)} = \frac{\Delta T_A - \Delta T_B}{\ln \Delta T_A - \ln \Delta T_B}$$

where ΔT_A is the temperature difference between the two streams at end *A*, and ΔT_B is the temperature difference between the two streams at end *B*. When the two temperature differences are equal, this formula does not directly resolve, so the LMTD is conventionally taken to equal its limit value, which is in this case trivially equal to the two differences.

With this definition, the LMTD can be used to find the exchanged heat in a heat exchanger:

$$Q = U \times A \times LMTD$$

Where *Q* is the exchanged heat duty (in watts), *U* is the heat transfer coefficient (in watts per kelvin per square meter) and *A* is the exchange area. Note that estimating the heat transfer coefficient may be quite complicated.

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

https://en.wikipedia.org/wiki/Logarithmic_mean_temperature_difference#/media/File:LMTD_illustration.jpg

34. Log-mean temperature difference in case of parallel flow compared to counterflow will be

1. Same 2. More 3. Less 4. Depends on others factors

Ans: 3

35. One Ton of refrigeration corresponds to

1. 50 kcal/min 2. 50 kcal/hr 3. 80 kcal/min 4. 80 kacl/hr

Ans: 1

36. If T_1 and T_2 are the highest and lowest absolute temperature in a Carnot cycle, the efficiency η is

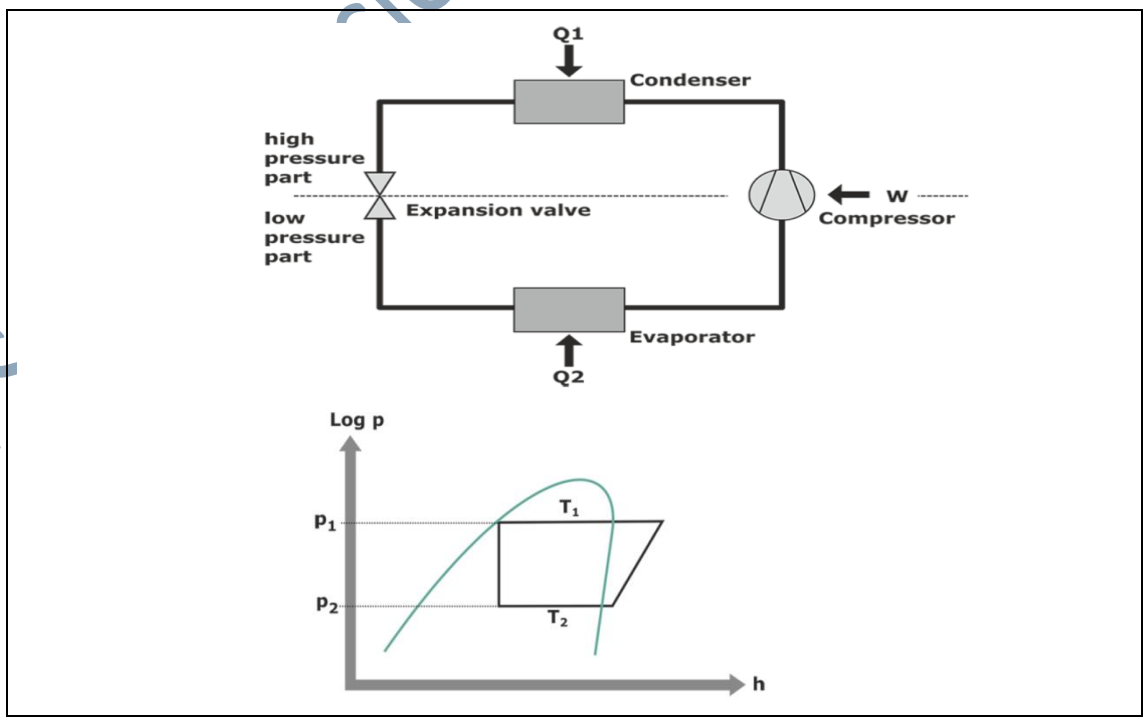
1. $\frac{T_1}{T_1-T_2}$ 2. $\frac{T_2}{T_1-T_2}$ 3. $\frac{T_1-T_2}{T_2}$ 4. $\frac{T_1-T_2}{T_1}$

Ans: 4

36.1 If T_1 and T_2 are the highest and lowest absolute temperature in a refrigeration cycle working as a reversed Carnot cycle, the C.O.P. is equal to

2. $\frac{T_1}{T_1-T_2}$ 2. $\frac{T_2}{T_1-T_2}$ 3. $\frac{T_1-T_2}{T_2}$ 4. $\frac{T_1-T_2}{T_1}$

Ans: 2



(2) $COP_{hp} = \frac{Q_1}{\sum W} = \frac{T_1}{T_2 - T_1}$

(3) $COP_{ref} = \frac{Q_2}{\sum W} = \frac{T_2}{T_2 - T_1}$

https://www.swep.net/refrigerant-handbook/2.-compression-cycle/zx/

36.1 If T_1 and T_2 are the highest and lowest absolute temperature in a heat pump Carnot cycle, the C.O.P. is equal to

1. $\frac{T_1}{T_1 - T_2}$ 2. $\frac{T_2}{T_1 - T_2}$ 3. $\frac{T_1 - T_2}{T_2}$ 4.

Ans: 1

37. The bank of tubes at the back of domestic refrigerator is

1. Condenser tubes
2. Evaporator tubes
3. Refrigerant cooling tubes
4. Throttling device

Ans: 1

38. In a heat pump, the condenser temp is 27°C and evaporator temperature is -23°C then the Carnot CO.P. is

1. 0.2 2. 1.2 3. 5 4. 6

Ans: 4 (CoP = $\frac{T_1}{T_1 - T_2} = \frac{300}{300 - 250} = 6$)

39. The normal lubricating oil for the reciprocating piston engines is

1. Mineral oil based
2. Vegetable oil based
3. Synthetic oil based
4. Fossil fuel based

Ans: 1

40. In power plant practice, the condenser vacuum is expressed in mm of mercury column. One mm of mercury corresponds to a pressure of

1. 133.3 Pa 2. 10^{-2} bar 3. $10^3 N/m^2$ 4. 9.81 kg/cm^2

Ans:1

One millimetre of mercury is approximately 1 Torr, which is ≈ 133.322368 Pascal).

Symbol: mmHg or mm Hg

SI units: 133.3224 Pa

English Engineering units: 0.01933678 lbf/in^2

$1\ atm = 760\ mmHg = 760\ torr = 101.3\ KPa = 14.7\ psi$

41. The efficiency of a steam nozzle is defined as follows:
    1. Ratio of isentropic enthalpy drop to actual enthalpy drop
    2. Ratio of useful enthalpy drop to isentropic enthalpy drop
    3. Ratio of saturation temperature of steam at the nozzle outlet to the temperature of steam at nozzle inlet
    4. Ratio of saturation pressure of steam at nozzle outlet to the pressure of superheated steam at nozzle inlet

    Ans: 1

42. The type of gas turbine cycle employed in the aircrafts is the following:

    1. Closed cycle 2. Open cycle 3. Combined cycle 4. Binary cycle
    Ans:2

43. Air injection in C.I. Engines refers to the following:
    1. Injection of air into the cylinder
    2. Injection of a atomized liquid fuel into the cylinder at the end of compression stroke
    3. Admission of air into the combustion chamber under pressure
    4. Injection of air into the exhaust manifold for pollution control

    Ans: 2

44. The system of lubrication employed in two-stroke cycle engines used in motor cycles and scooters is known as:
    1. Pressurised lubrication system
    2. Splash lubrication system
    3. Petrol lubrication system
    4. Wet sump lubrication

    Ans: 3

45. The prime mover having the maximum energy conversion efficiency is the following:
    1. Four-stroke S.I. engine
    2. Four-stroke C.I. engine
    3. Steam-turbine
    4. Hydraulic turbine

    Ans: 4

46. Blowdown operation in steam generating system is carried out for the following purpose.
1. Control of solids concentration in the feedwater
2. Control of drum level
3. Reducing steam pressure
4. Supply of hot water for emergency needs

Ans: 1

47. A steam trap is a fitment for
1. Condensing the steam
2. Separation of condensate from steam
3. Draining off the condensate resulting from partial condensation
4. Keeping the steam superheated

Ans: 3

48. ”Almagest” book on astronomy wss written by

(1) Galeleo (2) Hubble (3) Copernicus (4) Ptolemy

Ans:4 (Almagest, astronomical manual written about ad 150 by **Ptolemy (Claudius Ptolemaeus of Alexandria)**. It served as the basic guide for Islamic and European astronomers until about the beginning of the 17th century,)

49. The Supersonic jets tend to cause
(1) Destruction of ozone layer (2) sound pollution
(3) NervoussystemBreakdown (4) all the above.
Ans:1 (because they fly in strosphere)

50. One metre is equal to

(1) 1.0936 yard (2) 1.125 yard (3) 1.212 yard (4) 1.021 yard
Ans:1

51. A perfect black body is one which
1. Is black in colour
2. Reflects all heat
3. Transmits all heat radiations
4. Absorbs heat radiations of all wave lengths falling on it

Ans: 4