1. Deaeration of boiler feed water is carried out because it reduces
   1. Cavitation of boiler feed pumps
   2. Corrosion caused by the dissolved gases like oxygen
   3. Heat transfer coefficient
   4. pH value of water

   Ans: 2

2. Vegetables based oils are suitable for the operation of the following category of engines

   1. C.I. Engines 2. C.I./S.I. Engines 3, S.I. Engines 4. Gas Turbines

   Ans: 2 (e.g., biodiesel) and bioethanol for SI engines

3. The speed of a double overhead camshaft (DOHC) of a 4 stroke cycle piston engine running at 1500 rpm will be

   1. 1500 rpm 2. 750 rpm 3. 3000 rpm 4. 375 rpm

   Ans: 2

4. Automotive engine pistons are usually made of AI alloys mainly because of
   1. Lightweight 2, lower wear
   3. Higher thermal conductivities 4. Shock absorption

   Ans: 1

5. A De Laval steam turbines is of the following category
   1. A simple reaction turbine
   2. A simple impulse turbine
   3. A velocity compounded impulse turbine
   4. A velocity compounded impulse turbine

   Ans: 2

6. Carbon brushes are used in electric motors to :

   1. Brush off carbon deposits on the commutator
   2. Provide a path for flow of current
   3. Prevent overheating of armature windings
   4. Prevent sparking during commutation

   Ans: 2

7. The total auxiliaries (such as FD fan, ID fan, feed water pumps etc.,) power consumption in thermal power plants is of the order of

1. 2 to 5% 2. 8 to 10% 3. 20 to 25% 4. 25%

Ans: 2

8. The first Nuclear Power Plant in India was established at the following place

1. Kota 2. Tarapur 3. Kalpakkam 4.Kerala

Ans: 2

9. In an idling S.I. engine, the air-fuel mixture supplied by the carburetor is:

1. Stoichiometric 2. Lean 3. Very lean 4.Rich in fuel

Ans: 3

10. For head of 600 m of water the suitable turbine for a hydel power plant is the following:

1. Pelton turbine 2. Francis turbine
3. Kaplan turbine 4. Propeller turbine

Ans: 1

11. An orifice meter is an instrument for the measurement of the following parameter

1. Average velocity of flow in a duct 2. Velocity at a point in a flow field
3. Mass flow rate directly 4, volume flow rate directly

Ans: 4

12. Water walls in high pressure seam generating systems indicate the following

1. Water jacketing used on boiler drum
2. Water tubes lining the furnace walls
3. Water failing from the sides of cooling tower
4. Water tubes in the economiser

Ans: 2

13. On complete combustion, One kg of carbon produces the following quantity of CO_2

1. $\frac{4}{3}kg$ 2. $\frac{8}{3}kg$ 3. $\frac{7}{3}kg$ 4. $\frac{11}{3}kg$

Ans: 4 (3.67 kg)

14. In the case of a four-cylinder compression ignited naturally aspirated engine the energy loss through the exhaust gases is approximately:

1. 5 – 7% 2. 7 – 10% 3. 25 – 35% 4. 10 – 20%

Ans: 3

15 In the case of a four-cylinder compression ignited naturally aspirated engine the energy loss through the cooling water is approximately:

1. 5 – 7% 2. 7 – 10% 3. 30% 4. 10 – 20%

Ans: 3

16. A slowly cranking engine may be the result of the following factor

1. Vapour lock
2. Defective water pump
3. Run-down battery
4. None of these

Ans: 3

A: Possible causes: a marginal battery, a poor connection in the starting circuit or starter, a charging-system problem, or the battery is being drained while the car's parked.

17. Gas turbines are unsuitable for city road automotive use because of the following reason

1. Their high speeds of operation
2. Poor part load efficiency
3. High noise
4. Starting problem

Ans: 2

18. Flue gas recirculation in thermal power plants is a proven method for the control of the following parameter:

1. Fuel consumption
2. NO_x emission
3. Quantity of steam generated
4. Particulate emission

Ans: 1

This process **reduces peak flame temperature** and lowers the percentage of oxygen in the combustion air/flue gas mixture, thereby reducing thermal NOx formation.

19. The Ljungstrom preheaters employed in our 210 MW Thermal Power Plants is the following

1. And economiser
2. A recuperative air preheater
3. A rotary regenerative air preheater
4. An oil preheater

Ans: 3

20. The transmission loss of our Indian power plants is approximately the following:
    1. Less that 10 %
    2. 20 %
    3. 30 %
    4. 30-40 %

    Ans: 2

21. Some metallic pipes have the marking ERW on them. It means the following:
    1. Electrically Resistance Welded
    2. Elastic Reinforced with Wire
    3. Extra Reinforcement Welded
    4. Electrically Reinforced and Welded

    Ans: 1

22. For traction applications, the type of motor best suited is the following:
    1. Induction motor
    2. Synchronous motor
    3. DC Shunt motor
    4. DC Series motor

    Ans: 4 (Now ac motor is used.)

23. In foundry practice, the surfaces to be machined are marked on the pattern by the following colour:
    1. Black
    2. Yellow
    3. Red
    4. Blue

    Ans: 3

Traditionally, the paint on casting patterns was color coded, with colors denoting the finishing steps that would be needed for the casting. Although the standards no longer universally applicable, there are still foundries that use this basic color system.

Red—Indicates no machining needed on this surface of the final casting. Yellow—Indicates this surface to be machined on final casting. Black—Indicates the surface needs a core, and where the core's position might lie. Clear varnish or unpainted—Indicates parting line or join on the casting.

https://www.reliance-foundry.com/blog/foundry-pattern-casting

24. A plot of power generated versus time in a power plant is known as
    1. Load curve
    2. Load factor
    3. Demand curve
    4. Load duration curve

    Ans: 1

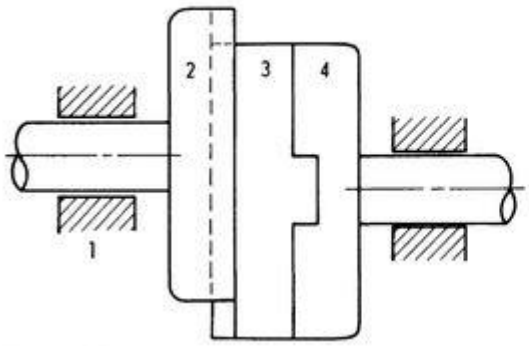
25. An Oldham's coupling belongs to the following category:

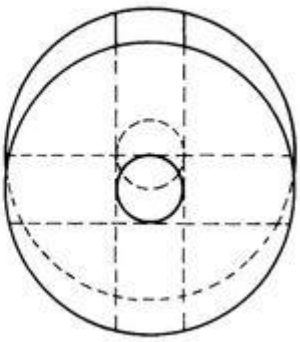
1. Second inversion of the double slider-crank chain
2. Third inversion of the double slider-crank chain
3. Second inversion of the single slider-crank chain
4. None of these

Ans: 4

Oldham's Coupling

Oldham's coupling is **an inversion of double slider-crank mechanism**. An Oldham coupler is a method to transfer torque between two parallel but offset at some distance. It is used to connect two parallel shafts whose axes are at a small distance apart. Two flanges, each having a rectangular slot, are keyed, one on each shaft. The two flanges are positioned such that, the slot in one is at right angle to the slot in the other. To make the coupling, a circular disc with two rectangular projections on either side and at right angle to each other, is placed between the two flanges. During motion, the central disc, while turning, slides in the slots of the flanges. Power transmission takes place between the shafts, because of the positive connection between the flanges and the central disc.





http://vlabs.iitkgp.ac.in/mr/exp6/index.html

26. A pitot tube/venture meter/orifice meter works on:

1. Bernoulli's Law principle
2. Posieuille's principle
3. Pascal's principle
4. Archimedes' principle

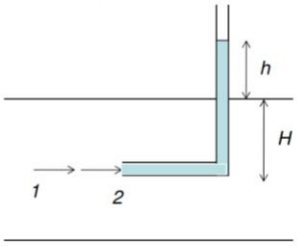
Ans: 1

Pitot tube

• Principle: If the velocity at any point decreases, the pressure at that point increases due to the conservation of the kinetic energy into pressure energy.

• In simplest form, the pitot tube consists of a glass tube, bent at right angles.

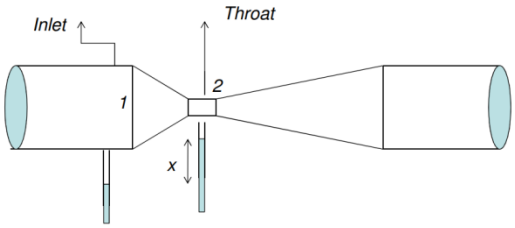
Let p_1 = pressure at section 1
p_2 = pressure at section 2
v_1 = velocity at section 1
v_2 = velocity at section 2 = 0
H = depth of tube in the liquid
h = rise of liquid in the tube above the free surface



Point 2 is just at the inlet of the Pitot-tube
Point 1 is far away from the tube

Venturimeter: is a device used for measuring the rate of flow of a fluid flowing through a pipe. It consists of three parts:

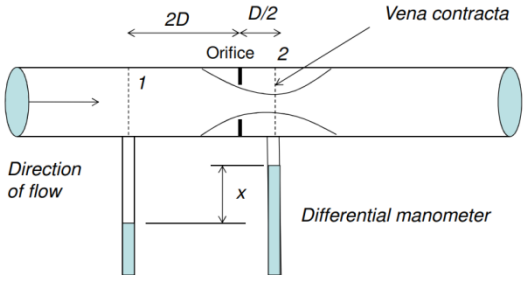
• A short converging part
• Throat
• Diverging part



Orifice meter

• It consists of flat circular plate which has a circular hole, in concentric with the pipe. This is called orifice.

• The diameter of orifice is generally 0.5 times the diameter of the pipe (D), although it may vary from 0.4 to 0.8 times the pipe diameter.



https://www.iith.ac.in/~ksahu/class11_FM

Bernoulli's principle. In fluid dynamics, Bernoulli's principle states that an increase in the speed of a fluid occurs simultaneously with a decrease in static pressure or a decrease in the fluid's potential energy.. The principle is only applicable for isentropic flows: when the effects of irreversible processes (like turbulence) and non-adiabatic processes (e.g. heat radiation) are small and can be neglected.

https://en.wikipedia.org/wiki/Bernoulli's_principle

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1. Posieuille's principle – fluid flow and pressure drop in pipe (In nonideal fluid dynamics, the **Hagen–Poiseuille equation**, **Poiseuille law** or **Poiseuille equation**, is a physical law that gives the pressure drop in an incompressible and Newtonian fluid in laminar flow flowing through a long cylindrical pipe of constant cross section.)
2. Pascal's principle - Pascal's principle, also called Pascal's law, in fluid (gas or liquid) mechanics, statement that, in a fluid at rest in a closed container, **a pressure change in one part is transmitted without loss to every portion of the fluid** and to the walls of the container; applied Hyd. Press, hyd. Brakes,etc
3. Archimedes' principle – Principle of Flotation; any body completely or partially submerged in a fluid (gas or liquid) at rest is acted upon by an upward, or buoyant, force, the magnitude of which is equal to the weight of the fluid displaced by the body.
   The volume of displaced fluid is equivalent to the volume of an object fully immersed in a fluid or to that fraction of the volume below the surface for an object partially submerged in a liquid.
   The weight of the displaced portion of the fluid is equivalent to the magnitude of the buoyant force.
   The buoyant force on a body floating in a liquid or gas is also equivalent in magnitude to the weight of the floating object and is opposite in direction; the object neither rises nor sinks.

   Britannica, The Editors of Encyclopaedia. "Archimedes' principle". ***Encyclopedia Britannica***, 29 May. 2020, https://www.britannica.com/science/Archimedes-principle. Accessed 15 October 2021.

27. Turbine is a prime mover which converts

1. Hydraulic energy to mechanical energy
2. Mechanical energy to hydraulic energy
3. Kinetic energy of flowing fluid (steam, combusted gas or water) to mechanical energy which in turn converted into electrical energy by an electric generator
4. Electrical energy to mechanical energy

Ans: 3

28. Which of the following materials has minimum ratio of endurance limit to the ultimate tensile strength?

1. Cast steel
2. Cast iron
3. Steel
4. Non-ferrous metals

Ans: 2

29. In the heat transfer equation , $Q = \frac{KA(t_1 - t_2)}{x}$, for a slab of thickness x,

where

Q or $\dot{Q}$=heat transfer rate, W

A = cross sectional area, m^2

t_1 = temperature on one side of the, K

t_2 = temperature on the other side of the slab, K and

K = thermal conductivity of the material of the slab, W/mK.

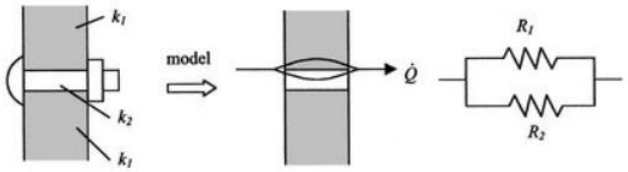
the team x/KA is known as the following:

1. Thermal resistance
2. Temperature gradient
3. Thermal coefficient
4. Heat flux

Example.

. If T_L is the temperature at the left, and T_R is the temperature at the right, the heat transfer rate is given by

$$\dot{Q} = \frac{T_L - T_R}{R} = \frac{T_L - T_R}{R_1 + R_2}.$$



https://web.mit.edu/16.unified/www/SPRING/propulsion/notes/node118.html

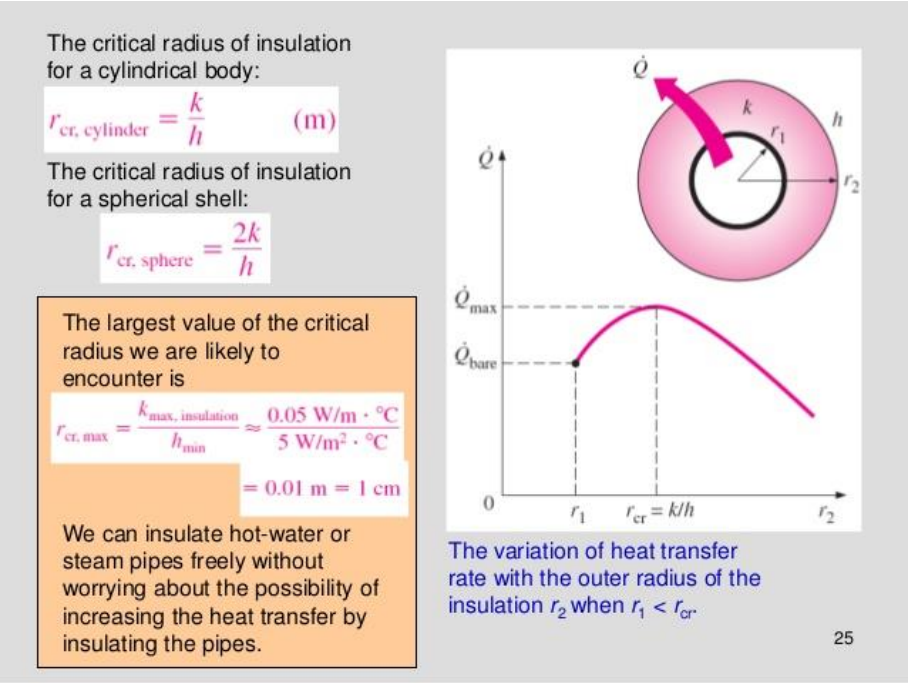
Ans: 1

30. The number of drums in Benson steam generator is as below:
    1. Two
    2. One
    3. One steam drum and one water drum
    4. Zero

Ans: 4 (In Benson steam generator is an once through boiler and hence there is no steam drum)

31. The critical radius of insulation for a cylindrical pipe is given by:
    1. $\frac{\text{Thermal conductivity of the insulating material,k}}{\text{2x Heat transfer coefficient at outer surface,h}}$
    2. $\frac{\text{2xThermal conductivity of the insulating material}}{\text{heat transfer coefficient at outer surface}}$
    3. Inverse of (1) above
    4. $\frac{\text{Thermal conductivity of the insulating material}}{\text{Heat transfer coefficient at outer surface}} = \frac{k}{h}$

Ans: 4 (The **thickness** upto which heat flow increases and after which heat flow decreases is termed as **critical thickness**. In the case of cylinders and spheres it is called **critical radius**. It can be derived the **critical radius of insulation** depends on the thermal conductivity of the insulation k and the external convection heat transfer coefficient h.)



https://isaacscienceblog.com/2018/02/18/the-critical-radius/

31.1 The cirtical radius of insulation for a spherical vessel is given by:

1. $\frac{\text{Thermal conductivity of the insulating material}}{\text{2 (Heat transfer coefficient at outer surface}}$
2. $\frac{\text{2 (Thermal conductivity of the insulating material)}}{\text{heat transfer coefficient at outer surface}}$
3. Inverse of (1) above
4. $\frac{\text{Thermal conductivity of the insulating material}}{\text{Heat transfer coefficient at outer surface}} = \frac{2k}{h}$

Ans: 4

32. The fluid handling capacity of an induced draft fan as compared to the forced draft fan in a steam power plant is the following:

1. The same
2. More
3. Can be less or more depending upon application
4. Less

Ans: 4

Induced draft fan

Fans that are used to evacuate a space or create negative air pressure in a system are referred to as induced draft fans.

Forced draft fan

Fans that are used to pressurize a space or create mechanical air pressure in a system are referred to as forced draft fans.

Sometimes, both the types of fans work together in the same equipment; a common example is air supply to the combustion side of a fired heater using both types.

33. The straight part of the thread which connects the crest with the root is

1. Flank 2. Fillet 3. Gib 4. Flare

Ans: 1

34. In the case of tractors, the spring provided on the rear wheels are

1. Multiple leaf spring
2. Helical coil spring
3. Combination of helical and leaf springs
4. No spring is provided

Ans: 1

35. The escape of burned gases from the combustion chamber past the pistons into the crankcase is known as

1. Gas bypass
2. Crankcase ventilation
3. Blow-bye
4. Dribbling

Ans: 3

36. In S.I. engine advancing spark timing

1. Reduces knocking tendency
2. Increases knocking tendency
3. Does not have any effect on knocking
4. Reduces exhaust gas temperature

Ans: 2

37. Cetane number of a diesel fuel is a measure of:

1. Volatility
2. Delay period
3. APU specific gravity
4. Ignition quality

Ans: 4

37.1 Octane number of a petrol fuel is a measure of:

1. Volatility
2. Delay period
3. antiknock rating
4. Ignition quality

Ans: 4

Octane number, also called **Antiknock Rating**, measure of the ability of a fuel to resist knocking when ignited in a mixture with air in the cylinder of an internal-combustion engine.

,,,,,,,,,,,,

Knock resistance

Knock resistance is a fuel's ability not to self-ignite and burn in an uncontrolled way while the fuel is being compressed. This means that the air-fuel mixture in the engine is not ignited only by the ignition spark, but also by compression. An octane number describes this phenomenon under defined conditions.

A high octane number can help increase the efficiency and thus performance of an engine. However, the octane number is not a measure of energy content or better combustion. More performance can only be achieved by adjusting the engine parameters to the fuel, not simply by fuelling with higher-octane gasoline. Diesel fuel in the tank due to misfuelling reduces the octane number and the continuous mixing of the gas – which is why just a few drops of diesel fuel in the gasoline may cause problems of the drive mode.

https://www.marquard-bahls.com/en/news-info/glossary/detail/term/octane-number-ron-mon-knock-resistance.html

38. C.I. Engines operate at lower engine speeds compared to S.I. engines because of

1. Higher compression ratio
2. Delay period
3. Heavier engine parts
4. Higher operating temperature

Ans: 3

39. The valve used to control the operation of another valve is:

1. Pilot valve
2. Spool valve
3. Globe valve
4. Needle valve

Ans: 1

40. Cryogenics is

1. Study of crystal
2. Study of genetics
3. Science of very low temperature
4. Study of colours

Ans: 3 (lower than -150°C)

Cryogenics: The branches of engineering that involve the study of very low

temperatures (lower than -150°C), how to produce them, and how materials behave at those temperatures. Liquefied gases, such as liquid nitrogen and liquid helium, are used in many cryogenic applications. Liquid nitrogen is the most commonly used element in cryogenics and is legally purchasable around the world. Liquid helium is also commonly used and allows for the lowest attainable temperatures to be reached. These liquids may be stored in Dewar flasks, which are double-walled containers with a high vacuum between the walls to reduce heat transfer into the liquid.
https://en.wikipedia.org/wiki/Cryogenics

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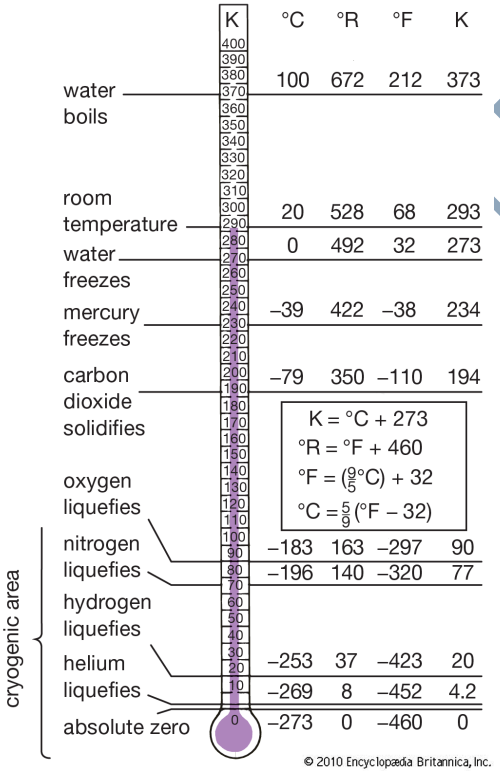
Cryogenics, production and application of low-temperature phenomena.

The cryogenic temperature range has been defined as from −150 °C (−238 °F) to absolute zero (−273 °C or −460 °F), the temperature at which molecular motion comes as close as theoretically possible to ceasing completely. Cryogenic temperatures are usually described in the absolute or Kelvin scale, in which absolute zero is written as 0 K, without a degree sign. Conversion from the Celsius to the Kelvin scale can be done by adding 273 to the Celsius scale.



https://www.britannica.com/science/cryogenics
Britannica, The Editors of Encyclopaedia. "cryogenics". ***Encyclopedia Britannica***, 26 May. 2017, https://www.britannica.com/science/cryogenics. Accessed 27 October 2021.

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WHAT IS CRYOGENICS USED FOR?

Cryogenics is used in a variety of applications. It can be used to produce cryogenic

fields for rockets, in MRI machines that use liquid helium and require cryogenic cooling, storing large quantities of food, special effects fog, recycling, freezing blood and tissue samples, and even cooling superconductors.

https://gaslab.com/blogs/articles/what-is-cryogenics

41. Aloxite is
    1. an additive added to fuel or oil
    2. an artificial abrasive
    3. a chemical added to coolant to lower its freezing point
    4. a thermosetting synthetic resin

    Ans: 2

Aluminium oxide is a chemical compound of aluminium and oxygen with the chemical formula Al_2O_3. It is the most commonly occurring of several aluminium oxides, and specifically identified as **aluminium(III) oxide**. It is commonly called **alumina** and may also be called **aloxide**, **aloxite**, or **alundum** depending on particular forms or applications. It occurs naturally in its crystalline polymorphic phase α-Al_2O_3 as the mineral corundum, varieties of which form the precious gemstones ruby and sapphire. Al_2O_3 is significant in its use to produce aluminium metal, as an abrasive owing to its hardness, and as a refractory material owing to its high melting point.
https://en.wikipedia.org/wiki/Aluminium_oxide

42. Brazing alloys is governed by the presence of
    1. Non ferrous filler metal
    2. Ferrous filler metal

    Ans: 1

43. A crystal that has tree like branching pattern which generally grow inward from the surface of a mould is
    1. Pearlite 2. Austenite 3. Dendrite 4. Martensite

    Ans: 3

44. Mixture (an alloy) in which the proportions of the constituents are such that the mixture has a lower melting point than any of the constituents is called
    1. Eutectic 2. Lamellar 3. Metalloid 4. Nornag

Ans: 1

45. A hydrous silicate of aluminium, fine white clay used in ceramics is
1. Belfast sand 2. Devizes sand 3. Kaolin 4. Erith sand

Ans: 3

46. A non-metal that exhibits some, but not all of the properties of a metal is called
1. Metalloid 2, Nornag 3. Clad metal 4. Crystalloid

Ans: 1

47. The speed of an aircraft t is measured by
(1) anemometer (2)odometer (3) Speedometer (4) tachometer
Ans:1

48. Which among the four is not closely allied to physiology?

(1) Bio-chemistry (2) cytology (3) entomology (4) physics.
Ans:4

49. Hydel power potential is not fully exploited in India because of

(1)Availability of vast coal reserves (2) water fully utilised for agriculture
(3)Unpredictable monsoon conditions (4) Lack of technological skill
Ans:3

50. Which of the following statements is true?
1. Desert Cooler is not efficient in coastal areas where there is high humidity
2. Desert Cooler should be combined with air conditioners in constal areas in summer for
effective use.
3. Desert Cooler will not below the atmospheric temperature when it is between 15 to 20^{o} C.
4. The power consumption of a Desert Cooler is lower than an air conditioner.

Ans: 1.

……..

Box.

Calcium sulfate hemihydrate (Plaster of paris) **$(CaSO_4)_2.H_2O$ or $Ca_2H_2O_9S_2$**