

**Question bank for GRE/GAT for the preparation of entry test in the discipline of M.Sc.  
(Hons.) Energy Systems Engineering, UAF**

- 1) In nature, \_\_\_\_\_ can always be found combined with other elements.
  - a) **Hydrogen**
  - b) Oxygen
  - c) Carbon
  - d) None of these
  
- 2) Deuterium has \_\_\_\_\_ the mass of hydrogen.
  - a) **Half**
  - b) twice
  - c) three times
  - d) None of these
  
- 3) Tritium's nucleus contains \_\_\_\_\_ proton and two neutrons.
  - a) **Two**
  - b) Three
  - c) one
  - d) None of these
  
- 4) Hydrogen has the highest energy density among \_\_\_\_\_.
  - a) **Gases**
  - b) solids
  - c) Fuels
  - d) Both 'a' and 'c'
  
- 5) Heating value of hydrogen is \_\_\_\_\_ times greater than hydrocarbons.
  - a) two
  - b) one
  - c) Both 'a' and 'b'
  - d) **None of these**
  
- 6) Steam/chemical reforming comprises of \_\_\_\_\_ main step(s).
  - a) **Two**
  - b) Three
  - c) one
  - d) None of these
  
- 7) High Temperature Shift, which occurs at temperatures of:
  - a) 250° C
  - b) **350° C**
  - c) 450° C
  - d) 500° C
  
- 8) The \_\_\_\_\_ step of steam reforming is represented by the following equation:  
$$\text{CO} + \text{H}_2\text{O} \rightleftharpoons \text{CO} + \text{H}_2$$
  - a) Second
  - b) **First**

- c) Third  
d) None of these
- 9) Electrolysis, where an ionic compound is broken down into its component elements by passing an \_\_\_\_\_ through it.  
a) Voltage  
b) **Current**  
c) Both 'a' and 'b'  
d) None of these
- 10) Water splitting via photosynthesis is carried out in \_\_\_\_\_.  
a) leaves  
b) **cyanobacteria**  
c) Both 'a' and 'b'  
d) None of these
- 11) Temperature range of thermolysis is:  
a) 2000-4500° C  
b) 2500-4000° C  
c) 2500-5000° C  
d) **2000-5000° C**
- 12) Spent fuel from radiolysis is usually stored in water pools, as \_\_\_\_\_ disposal.  
a) **Temporary**  
b) Permanent  
c) Both 'a' and 'b'  
d) None of these
- 13) Hydrogen yield from radiolysis is usually:  
a) High  
b) **Low**  
c) Very high  
d) None of the above
- 14) Hydrogen has the \_\_\_\_\_ energy per mass of any fuel.  
a) **Highest**  
b) Lowest  
c) Both 'a' & 'b'  
d) None of the above
- 15) Water splitting can be achieved by:  
a) Hydrolysis  
b) Electrolysis  
c) Catalysis  
d) **All of the above**
- 16) Compressed hydrogen takes \_\_\_\_\_ space than gas.  
a) **More**  
b) Less

- c) Equal
  - d) None of these
- 17) Blending can \_\_\_\_\_ the cost of building dedicated hydrogen pipelines or other costly delivery infrastructure.
- a) increase
  - b) **reduce**
  - c) Both 'a' and 'b'
  - d) None of these
- 18) \_\_\_\_\_ is an abbreviation for Hydrogen Internal Combustion Engine.
- a) ICE
  - b) **HICE**
  - c) Both 'a' and 'b'
  - d) None of these
- 19) If \_\_\_\_\_ is partially used as an input, the resulting thermochemical cycle is defined as a hybrid one.
- a) Fuel
  - b) **electricity**
  - c) Both 'a' and 'b'
  - d) None of these
- 20) A temperature of \_\_\_\_\_ can be achieved by using CSP systems.
- a) **950° C**
  - b) 850° C
  - c) 975° C
  - d) 875° C
- 21) Ferrosilicon is used by the military to produce hydrogen due to the \_\_\_\_\_ nature of the reaction.
- a) **Fast**
  - b) Slow
  - c) Cheap
  - d) Efficient
- 22) A heavy steel pressure vessel is filled with \_\_\_\_\_ and ferrosilicon, closed, and a controlled amount of water is added.
- a) sodium dioxide
  - b) **sodium hydroxide**
  - c) hydrogen peroxide
  - d) all of the above
- 23) Backfiring is common issue for \_\_\_\_\_.
- a) ICE
  - b) HICE
  - c) **Both 'a' and 'b'**
  - d) None of these

- 24) NOX emissions are \_\_\_\_\_ in HICE as compared to ICE.
- increased**
  - reduced
  - Both 'a' and 'b'
  - None of these
- 25) \_\_\_\_\_ are a cause of GHGs which are generated as products.
- Fuel cells
  - engines**
  - Both 'a' and 'b'
  - None of these
- 26) The negative electrode of the fuel cell is known as \_\_\_\_\_.
- Anode**
  - Cathode
  - Both 'a' and 'b'
  - None of these
- 27) The fuel in a fuel cell is oxidized at the \_\_\_\_\_.
- Anode**
  - Cathode
  - Both 'a' & 'b'
  - None of the above
- 28) The electrolyte in a fuel cell serves as a medium for \_\_\_\_\_ transport.
- electron
  - ion**
  - Both 'a' and 'b'
  - None of these
- 29) \_\_\_\_\_ systems permit transfer of energy and mass.
- Closed
  - Open**
  - Isolated
  - All of the above
- 30) \_\_\_\_\_ is obtained from the transport of electrons across a potential difference by mechanical means.
- Work**
  - Force
  - Both 'a' and 'b'
  - None of these
- 31)  $\Delta E = \Delta U + \Delta KE + \Delta(PV)$   
The above reaction is an equation of energy change for an \_\_\_\_\_.
- Closed system**
  - Open system
  - Isolated system
  - None of the above

- 32) \_\_\_\_\_ is a measure of total disorder present in a system.
- a) **Entropy**
  - b) Enthalpy
  - c) Both 'a' and 'b'
  - d) None of these
- 33) Cell \_\_\_\_\_ is identification of potential difference between the two electrodes.
- a) current
  - b) **Voltage**
  - c) Both 'a' and 'b'
  - d) None of these
- 34)  $\Delta H = W - NFE$   
This equation represents \_\_\_\_\_ law in fuel cells.
- a) **Second**
  - b) First
  - c) Both 'a' and 'b'
  - d) None of these
- 35) The \_\_\_\_\_ law imposes restrictions on the direction of energy transfer.
- a) **Second**
  - b) First
  - c) Both 'a' and 'b'
  - d) None of these
- 36) The \_\_\_\_\_ law proscribes the conversion of heat to work.
- a) Second
  - b) **First**
  - c) Both 'a' and 'b'
  - d) None of these
- 37) The direction of energy transfer is better defined in \_\_\_\_\_.
- a) 1<sup>st</sup> law of thermodynamics
  - b) **2<sup>nd</sup> law of thermodynamics**
  - c) Both 'a' & 'b'
  - d) None of the above
- 38) A system is said to undergo an irreversible change if it remains in equilibrium as it passes from its initial state to its final state.
- a) irreversible
  - b) **reversible**
  - c) Both 'a' and 'b'
  - d) None of these
- 39) If no changes take place in the cell except during the passage of \_\_\_\_\_, and all changes which accompany the current can be reversed by reversing the current, the cell may be called a perfect electrochemical apparatus.
- a) voltage
  - b) **current**

- c) Both 'a' and 'b'  
d) None of these
- 40) Irreversible processes generate \_\_\_\_\_ by frictional heat loss and heat transfer through a finite temperature difference.  
a) enthalpy  
**b) entropy**  
c) both 'a' & 'b'  
d) none of the above
- 41) 2<sup>nd</sup> law of thermodynamics states that \_\_\_\_\_ applies for irreversible processes.  
a) equality  
**b) inequality**  
c) Both 'a' and 'b'  
d) None of these
- 42)  $dG = dH - TdS$   
This is the thermodynamic expression for the useful \_\_\_\_\_ obtainable from a system.  
a) **free energy**  
b) work  
c) Both 'a' and 'b'  
d) None of these
- 43) It is important that the membrane must be electrically conductive, so the half \_\_\_\_\_ do not mix.  
a) **chemicals**  
b) products  
c) Both 'a' and 'b'  
d) None of these
- 44) The H<sub>2</sub> gas (i.e., from a reactant) and \_\_\_\_\_ can exist inside the porous structure of an electrode which increases its surface area.  
a) **electrons**  
b) protons  
c) Both 'a' and 'b'  
d) None of these
- 45) The current produced from fuel cells depends on:  
a) Rate of inflow of reactants  
b) Rate of outflow of products  
**c) Rate of reaction**  
d) All of the above
- 46) Applying a \_\_\_\_\_ to an electrode generates an electric field at the electrode/electrolyte interface that reduces the magnitude of the activation energy barrier increasing the ET reaction rate.  
a) current  
**b) voltage**  
c) Both 'a' and 'b'  
d) None of these

- 47) Many \_\_\_\_\_ reactions exchange 1 mol of electrons for 1 mol of reactant
- electrochemical**
  - chemical
  - Both 'a' and 'b'
  - None of these
- 48) Between an electrode and the electrolyte, there exists a complex structure known
- DLC
  - EDLC**
  - Both 'a' and 'b'
  - None of these
- 49) At the \_\_\_\_\_ of an acid electrolyte fuel cell, electrons collect at the surface of the electrode.
- Cathode**
  - Anode
  - Both 'a' & 'b'
  - None of the above
- 50) Fuel cells on basis of operating temperature range can be classified into \_\_\_\_\_ types.
- Three**
  - Four
  - Five
  - Six
- 51) In a special type of \_\_\_\_\_, reactants can be passed through the fuel cell many times
- reactor
  - fuel cell**
  - Both 'a' and 'b'
  - None of these
- 52) Acidic polymer membrane is used in:
- Proton Exchange Membrane Fuel Cell (PEMFC)**
  - Phosphoric Acid Fuel Cell (PAFC)
  - Solid Oxide Fuel Cell (SOFC)
  - All of the above
- 53) Proton Exchange Membrane Fuel Cell (PEMFC) can be used at temperatures of \_\_\_\_\_.
- 300 °C
  - 200 °C**
  - 400 °C
  - None of these
- 54) Proton Exchange Membrane Fuel (PEMFC) gives a \_\_\_\_\_ output of power.
- varying**
  - constant
  - Both 'a' and 'b'
  - None of these

- 55) DMFC operate at a temperature range of:
- a) 50-150° C
  - b) 40-130° C
  - c) **60-130° C**
  - d) 60-150° C
- 56) A silicon carbide matrix is used in:
- a) Proton Exchange Membrane Fuel Cell (PEMFC)
  - b) Direct Methanol Fuel Cell (DMFC)
  - c) **Phosphoric Acid Fuel Cell (PAFC)**
  - d) Solid Oxide Fuel Cell (SOFC)
- 57) AFC offers \_\_\_\_\_ electrical efficiencies.
- a) **low**
  - b) high
  - c) Both 'a' and 'b'
  - d) None of these
- 58) AFC are very \_\_\_\_\_ to fuel poisoning.
- a) **susceptible**
  - b) resistant
  - c) Both 'a' and 'b'
  - d) None of these
- 59) \_\_\_\_\_ can generate power from hydrocarbons.
- a) **SOFC (Solid Oxide Fuel Cell)**
  - b) Direct Methanol Fuel Cell (DMFC)
  - c) Alkaline Fuel Cell (AFC)
  - d) Proton Exchange Membrane Fuel Cell (PEMFC)
- 60) The United States space program has used which fuel cell since the 1960s.
- a) Solid Oxide Fuel Cell (SOFC)
  - b) **Alkaline Fuel Cell (AFC)**
  - c) **Proton Exchange Membrane Fuel Cell (PEMFC)**
  - d) Molten Carbonate Fuel Cell (MCFC)
- 61) Which of the following fuel cell type is the cheapest to manufacture?
- a) Solid Oxide Fuel Cell (SOFC)
  - b) **Alkaline Fuel Cell (AFC)**
  - c) Molten Carbonate Fuel Cell (MCFC)
  - d) None of the above
- 62) PAFC operates at a \_\_\_\_\_ temperature than Proton Exchange Membrane Fuel (PEMFC).
- a) lower
  - b) **higher**
  - c) equal
  - d) None of these



- 63) Phosphoric Acid Fuel Cells (PAFCs) are CO<sub>2</sub> tolerant and even can tolerate a CO concentration of about 1.5 percent, which broadens the choice of fuels they can use.
- a) 0.5%
  - b) 0.7%
  - c) 1.5%**
  - d) 1.7%
- 64) An ink of catalyst, \_\_\_\_\_, and electrode are sprayed or painted onto the solid electrolyte and is hot pressed on either side to protect the inside of the cell and also act as electrodes in Proton Exchange Membrane Fuel (PEMFC).
- a) Ceramic
  - b) Platinum
  - c) Carbon**
  - d) None of the above
- 65) Proton Exchange Membrane Fuel (PEMFC) are most suited for transport due to their:
- a) Operating temperature**
  - b) Efficiency
  - c) Heavy weight
  - d) All of the above
- 66) Molten Carbonate Fuel Cell (MCFC) have an \_\_\_\_\_ operating temperature than Solid Oxide Fuel Cell (SOFC).
- a) higher
  - b) lower**
  - c) equal
  - d) None of these
- 67) The anode of Molten Carbonate Fuel Cell (MCFC) is made of \_\_\_\_\_.
- a) Co
  - b) Ni**
  - c) Pt
  - d) None of the above
- 68) Solid Oxide Fuel Cell (SOFC) operating temperature range is:
- a) 800-1000° C
  - b) 700-1000° C**
  - c) 850-1000° C
  - d) 750-1000° C
- 69) Solid Oxide Fuel Cells (SOFCs) are not stable when in \_\_\_\_\_ use due to the high operating temperature range.
- a) continuous
  - b) non-continuous**
  - c) Both 'a' and 'b'
  - d) None of these
- 70) CHP is used in:
- a) Molten Carbonate Fuel Cell (MCFC)
  - b) Alkaline Fuel Cell (AFC)

- c) **Solid Oxide Fuel Cell (SOFC)**  
d) Direct Methanol Fuel Cell (DMFC)
- 71) Regenerative Fuel Cell (RFC) can be thought of as a device that takes that waste product and electricity to return the original \_\_\_\_ fuel.  
a) gaseous  
b) **chemical**  
c) Both 'a' and 'b'  
d) None of these
- 72) Define an energy carrier?  
a) An energy carrier moves energy in usable or non-usable form  
b) **An energy carrier and delivers energy in a usable form to consumer**  
c) It moves energy from one trophic level to another  
d) It transfers energy from one ecosystem to the other
- 73) What is the Gibbs Helmholtz used for?  
a) **Used for calculating changes in the Gibbs free energy of a system as a function of temperature**  
b) Used for calculating negative changes in the Gibbs energy of a system as a function of temperature  
c) Both of these  
d) None of the these
- 74) A thermodynamic quantity representing the unavailability of systems heat for conversion into useful work is called \_\_\_\_\_.  
a) **Entropy**  
b) Enthalpy  
c) Internal energy  
d) Gibbs free energy
- 75) Which one of the following thermodynamic quantities is **not** a state function?  
a) **Gibbs free energy**  
b) Entropy  
c) Enthalpy  
d) Internal energy
- 76) The entropy will usually increase when  
I. a molecule is broken into two or more smaller molecules.  
II. a reaction occurs that results in an increase in the number of moles of gas.  
III. a solid changes to a liquid.  
IV. a liquid changes to a gas  
a) I only  
b) II only  
c) III only  
d) **All of the above**
- 77) Which statement is **incorrect**?  
(a) At constant pressure,  $\Delta H = \Delta E + P\Delta V$   
(b) The thermodynamic symbol for entropy is S.

- (c) Gibbs free energy is a state function.  
 (d) **For an endothermic process,  $\Delta H$  is negative.**
- 78) Which statement is **false**?
- (a) The thermodynamic quantity most easily measured in a "coffee cup" calorimeter is  $\Delta H$ .  
 (b) No work is done in a reaction occurring in a bomb calorimeter.  
 (c)  $\Delta H$  is sometimes exactly equal to  $\Delta E$ .  
 (d)  **$\Delta H$  is equal to  $\Delta E$  for the reaction.**
- 79) During electrolysis, hydrogen is generated at the \_\_\_\_\_.
- a) **Cathode**  
 b) Anode  
 c) It's too easy  
 d) I don't know
- 80) The heat of the reaction between Zn and HCl is \_\_\_\_\_.
- a) **-80.7 kJ**  
 b) +80.7 kJ  
 c) -90.7 kJ  
 d) +90.7 kJ
- 81) What are direct methanol fuel cells (DMFC)?
- a) **Direct methanol fuel cells or DMFCs are a subcategory for proton exchange fuel cells in which methanol is used as the fuel.**  
 b) DMFC are a subcategory of electron exchange fuel cells in which methanol is used as the fuel.  
 c) DMFC are a subcategory of proton exchange fuel cells in which hydrogen is used as the fuel.  
 d) DMFC are a subcategory of electron exchange fuel cells in which hydrogen is used as the fuel.
- 82) Phosphoric Acid Fuel Cells (PAFCs) can operate using \_\_\_\_\_ or biogas.
- a) biofuel  
 b) producer gas  
 c) wood gas  
 d) **reformed hydrocarbon fuels**
- 83) \_\_\_\_\_ is typically the transfer of a pattern into a photosensitive material by selective exposure to a radiation source such as light.
- a) Photography  
 b) Laser writing  
 c) **Lithography**  
 d) Optography
- 84) A spherical particle having a diameter (D) of 50 nm will have a surface area of \_\_\_\_\_.
- a)  $1.55 \times 10^{-7}$   
 b)  $1.55 \times 10^{-14}$   
 c)  **$1.57 \times 10^{-14}$**

- d)  $1.57 \times 10^{-7}$
- 85) \_\_\_\_\_ is a 3D translationally periodic arrangement of atoms.
- a) **Lattice**
  - b) Crystal
  - c) Glass
  - d) None of the above
- 86) \_\_\_\_\_ defines the spatial arrangement of atoms in a crystal lattice.
- a) Bravais lattice
  - b) **Unit cell**
  - c) Motif
  - d) Space lattice
- 87) “Structural magic number”, is the optimum number of \_\_\_\_\_ that leads to a stable configuration while maintaining a specific structure.
- a) electrons
  - b) **atoms**
  - c) protons
  - d) None of these
- 88) Young’s modulus is a mechanical property that measures the \_\_\_\_\_ of a solid material.
- a) **stress**
  - b) brittleness
  - c) Both ‘a’ and ‘b’
  - d) None of these
- 89) Nanoparticles \_\_\_\_\_ grain boundaries of the material.
- a) Decrease
  - b) **Increase**
  - c) Have no affect
  - d) None of the above
- 90) \_\_\_\_\_ occurs when length of contact resistance is larger than resistance of nanostructures and total capacitance of object is so small that adding a single electron requires significant energy.
- a) Coulomb staircase
  - b) **Coulomb blockade**
  - c) Tunnelling
  - d) Ballistic conduction
- 91) A unit cell is characterized by \_\_\_\_\_ parameters.
- a) Three
  - b) **Six**
  - c) Nine
  - d) None of the above
- 92) There are \_\_\_\_\_ Bravais lattices in 2D.
- a) Three

- b) Four
  - c) Five**
  - d) Six
- 93) The Arc Discharge method used for Carbon Nanotube (CNT) production uses a strong current of \_\_\_\_\_.
- a) 80 A
  - b) 95 A
  - c) 100 A**
  - d) 150 A
- 94) \_\_\_\_\_ can produce bulk amounts of defect-free Carbon Nanotubes (CNTs).
- a) Arc discharge method
  - b) Laser ablation
  - c) Chemical vapor deposition**
  - d) All of the above
- 95) The furnace is raised to a temperature between \_\_\_\_\_ for Carbon Nanotubes (CNT) production in Chemical Vapour Deposition (CVD).
- a) 500 - 800°C
  - b) 500 - 1000°C
  - c) 500 - 1200°C**
  - d) 500 - 1400°C
- 96) As a result of Chemical Vapour Deposition (CVD) impurities such as fullerenes are produced along with \_\_\_\_\_.
- a) Graphene
  - b) Carbon Nanotubes (CNT's)
  - c) Both 'a' and 'b'
  - d) None of these
- 97) A substrate material (e.g. \_\_\_\_\_), is cleaned in preparation for Carbon nanotubes (CNT) production via Chemical Vapour Deposition (CVD).
- a) Graphite
  - b) Carbon sheet
  - c) Alumina**
  - d) All of the above
- 98) Nanotubes are members of the \_\_\_\_\_ structural family.
- a) **Fluorenes**
  - b) Bucky balls
  - c) Both 'a' and 'b'
  - d) None of these
- 99) \_\_\_\_\_ are formed from a rolled up a carbon sheet.
- a) Graphene
  - b) Carbon Nanotubes (CNTs)**
  - c) Both 'a' and 'b'
  - d) None of these

- 100) Interlayer distance in MWCNTs is:  
a) 3.2 Å  
b) 3.3 Å  
c) **3.4 Å**  
d) 3.5 Å
- 101) Single wall Carbon Nanotubes (SWCNTs) have a \_\_\_\_\_ tensile strength when compared to Multiwall Carbon Nanotubes (MWCNTs).  
a) **Lower**  
b) Higher  
c) Equal  
d) None of the above
- 102) Anode and cathode terminals (for \_\_\_\_\_ production) are placed in an inert environment (i.e., nitrogen).  
a) Graphene  
b) Carbon Nanotubes (CNT)  
c) Both 'a' and 'b'  
d) None of these
- 103) Solid \_\_\_\_\_ is evaporated at 3000°C.  
a) Carbon  
b) Graphite  
c) **Both 'a' and 'b'**  
d) None of these
- 104) Nanotubes can grow at a higher rate on a \_\_\_\_\_ substrate.  
a) Non-porous  
b) **Porous**  
c) Solid  
d) None of the above
- 105) \_\_\_\_\_ have been constructed with length-to-diameter ratio of up to 1000,000:1.  
a) **CNT**  
b) Graphene  
c) Both 'a' and 'b'  
d) None of these
- 106) CNTs are long, thin cylinders of \_\_\_\_\_.  
a) Graphite  
b) **Carbon**  
c) Graphene  
d) None of the above
- 107) The phenomenon of \_\_\_\_\_ excitation energy with decreasing size of particles is known as quantum confinement.  
a) **increasing**  
b) decreasing  
c) Both 'a' and 'b'  
d) None of these

- 108) The same size dot of different materials may fundamentally not be both:
- a) graphene
  - b) **quantum dots**
  - c) Both 'a' and 'b'
  - d) None of these
- 109) The Bohr Diameter determines the type of confinement which is \_\_\_ than 2 mm.
- a) bigger
  - b) **smaller**
  - c) Both 'a' and 'b'
  - d) None of these
- 110) The goal of quantum dots is to engineer potential energy barriers to confine electrons in \_\_\_\_\_.
- a) **0D**
  - b) 2D
  - c) 3D
  - d) None of these
- 111) Bits have \_\_\_\_\_ possible values.
- a) **Two**
  - b) Three
  - c) Four
  - d) None of the above
- 112) Is having a \_\_\_\_\_ band gap bad for graphene?
- a) big
  - b) **no**
  - c) small
  - d) None of these
- 113) Quantum wells are also denoted by:
- a) **2D**
  - b) 3D
  - c) 0D
  - d) None of the above
- 114) Quantum dots are semiconductors \_\_\_\_\_.
- a) **nanocrystals**
  - b) crystals
  - c) Both 'a' and 'b'
  - d) None of these
- 115) Quantum dots have \_\_\_\_\_ diameters.
- a) **small**
  - b) big
  - c) Both 'a' and 'b'
  - d) None of these

- 116) Exciton Bohr radius can be defined as the separation distance between electrons.
- a) **hole-electrons**
  - b) electrons
  - c) hole
  - d) None of these
- 117) The total energy of exciton doesn't change until, the size of crystallite \_\_\_\_\_ than the exciton Bohr radius.
- a) **Less**
  - b) greater
  - c) equal
  - d) None of the above
- 118) Capacitance of a capacitor depends on:
- a) Shape of the plates
  - b) Size of the plates
  - c) The charge of the plates
  - d) **None of the above**
- 119) \_\_\_\_\_ have a high energy density and low power density.
- a) batteries
  - b) **supercapacitors**
  - c) Both 'a' and 'b'
  - d) None of these
- 120) Due to decrease of distance between electrodes, the \_\_\_\_\_ of a supercapacitor becomes very huge.
- a) Energy density
  - b) Power density
  - c) **Capacitance**
  - d) All of the above
- 121) Which of these methods is not used for graphene production?
- a) Chemical vapor deposition
  - b) Hummers method
  - c) Modified Hummers method
  - d) **None of the above**
- 122) The only difference between Physical Vapour Deposition (PVD) and Chemical Vapour Deposition (CVD) is the use of:
- a) **Reactants**
  - b) Products
  - c) Both 'a' & 'b'
  - d) None of the above
- 123) Substrate used in Chemical Vapour Deposition (CVD) for graphene is usually a transition metal (Ni/Cu) or:
- a) Ceramic
  - b) Glass



- c) **Both 'a' & 'b'**  
d) None of the above
- 124) Gases used for graphene production are generally \_\_\_\_\_ (source of carbon), Hydrogen, and Argon are also used along with methane as reaction catalyst.  
a) **methane**  
b) oxygen  
c) carbon  
d) None of these
- 125) Temperatures \_\_\_\_ than 1000° C are used to obtain higher quality of graphene.  
a) **less**  
b) more  
c) equal  
d) None of these
- 126) One of advantages of obtaining graphene by mechanical exfoliation is \_\_\_\_ quality.  
a) low  
b) **high**  
c) Both 'a' and 'b'  
d) None of these
- 127) Skilled labor is \_\_\_\_\_ for mechanical exfoliation as the procedure is easy to perform.  
a) **require**  
b) not required  
c) Both 'a' and 'b'  
d) None of these
- 128) The main concept behind the process is that the vapour pressure of Silicon is \_\_\_\_\_, as a result of \_\_\_\_\_ the SiC wafer for graphene production.  
a) Lower and heating  
b) Lower and cooling  
c) **Higher and heating**  
d) Higher and cooling
- 129) Evaluation for the \_\_\_\_\_ of graphene is done by observing the quantized oscillations of the electron reflectivity.  
a) **Amount**  
b) Quality  
c) Amount & quality  
d) None of the above
- 130) Ultra-High Voltage (UHV) method favors the formation of \_\_\_\_\_ graphene.  
a) **layered**  
b) multi-layered  
c) Both 'a' and 'b'  
d) None of these

- 131) Which is an easy method one for the growth of graphene crystals?
- Chemical Vapor Deposition
  - Mechanical exfoliation
  - Epitaxial growth**
  - Hummers method
- 132) The Hummers method is used for producing graphene by \_\_\_\_\_ graphite to GO by using suitable chemicals.
- Reducing
  - Reacting
  - Exfoliating
  - None of the above**
- 133) The modified Hummers method introduces a way to get a more \_\_\_\_\_ colloidal solution.
- graphite oxide**
  - graphene
  - Both 'a' and 'b'
  - None of these
- 134) Centrifugation step in the Hummer's method is used to \_\_\_\_\_ the solution.
- Dilute**
  - Concentrate
  - Purify
  - Maintain the pH
- 135) Thermal reduction gives a better-quality graphene, it has its own \_\_\_\_\_.
- Advantages
  - Disadvantages**
  - Both 'a' & 'b'
  - None of the above
- 136) Thickness of the produced graphene is better controlled in:
- Chemical Vapor Deposition
  - Mechanical exfoliation
  - Epitaxial growth method**
  - Electrochemical exfoliation growth
- 137) In electrochemical exfoliation, the choice of electrolyte is based on the requirement of the oxidizing environment.
- oxidizing**
  - reducing
  - Both 'a' and 'b'
  - None of these
- 138) In electrochemical exfoliation, a voltage of +/- 10V is applied generally for an \_\_\_\_\_ period.
- equal
  - unequal**
  - Both 'a' and 'b'

- d) None of these
- 139) In electrochemical exfoliation, the \_\_\_\_\_ used is often washed with DI water.
- electrode**
  - electrolyte
  - Both 'a' and 'b'
  - None of these
- 140) Which of the production method affects the conductivity of graphene?
- Chemical vapor deposition
  - Hummers method
  - Epitaxial growth method
  - Electrochemical exfoliation method**
- 141) \_\_\_\_\_ is a method where Quantum wells are covered with a polymer mask and exposed to laser.
- Lithography**
  - Chemical Vapour Deposition (CVD)
  - Physical Vapour Deposition (PVD)
  - None of these
- 142) Density of the quantum dots is \_\_\_\_\_ in epitaxy patterned growth.
- not controlled**
  - controlled
  - Both 'a' and 'b'
  - None of these
- 143) Controlled size and shape of \_\_\_ is very beneficial for various applications.
- Quantum dots**
  - Carbon Nanotubes (CNTs)
  - graphene
  - None of these
- 144) By applying small varying voltages, the flow of electrons through the quantum dot can be \_\_\_\_\_.
- controlled**
  - uncontrollable
  - Both 'a' and 'b'
  - None of these
- 145) Low-cost manufacturing process is beneficial for high cost materials in \_\_\_ quantities.
- small**
  - large
  - Both 'a' and 'b'
  - None of these
- 146) Solar energy is converted into -----by Photovoltaic cell:
- Heat energy
  - electric energy**
  - mechanical energy

- d) chemical energy
- 147) \_\_\_\_\_ temperature treatment usually improves the crystallinity of TiO<sub>2</sub> nanomaterials.
- a) Low
  - b) **High**
  - c) Both 'a' and 'b'
  - d) None of these
- 148) The nano-aluminium particles of \_\_\_\_\_ size are added to composite solid propellants based on ammonium perchlorate and hydroxyl-terminated poly-butadiene binder that exhibit plateau burning rate trends.
- a) **100 nm**
  - b) 150 nm
  - c) Both 'a' and 'b'
  - d) None of these
- 149) Due to multiple reflections in thin film solar cells, the effective optical path for absorption is much larger than the actual film thickness.
- a) reflectiveness
  - b) **absorption**
  - c) Both 'a' and 'b'
  - d) None of these
- 150) Quantum dots can generate exciton after collision with \_\_\_\_\_.
- a) **photons**
  - b) electrons
  - c) protons
  - d) None of these
- 151) Graphite's has weak interatomic \_\_\_\_\_ forces.
- a) **Van der Waals**
  - b) Covalent bond
  - c) Ionic bond
  - d) None of the above
- 152) \_\_\_\_\_ is stronger than diamond.
- a) **graphene**
  - b) carbon
  - c) graphite
  - d) None of these
- 153) Graphene absorbs \_\_\_\_\_ white light.
- a) Greater than 1%
  - b) Greater than 2%
  - c) **Greater than 3%**
  - d) Greater than 4%
- 154) Graphene doped with 'N' or 'B' \_\_\_\_\_ exhibits properties which are on par with Si.
- a) **does not**
  - b) does
  - c) Both 'a' and 'b'

- d) None of these
- 155) Doping of graphene is dependent on the type of \_\_\_\_\_ used.
- a) doping element
  - b) **graphene**
  - c) Both 'a' and 'b'
  - d) None of these
- 156) Quantum Dot LED has advantages of:
- a) **Cheap**
  - b) **Power efficient**
  - c) Less saturated blue
  - d) **Brighter**
  - e) All of the above
- 157) With today's technology at our disposal the size of quantum dots can be easily tuned according to our \_\_\_\_\_.
- a) **applications**
  - b) Taste
  - c) Both 'a' and 'b'
  - d) None of these
- 158) Even after fine tuning specific properties Quantum dots \_\_\_\_ emit a specific wavelength of light.
- a) **cannot**
  - b) can
  - c) Both 'a' and 'b'
  - d) None of these
- 159) The distance between electrodes of a capacitor is a few \_\_\_\_\_.
- a) **millimeters**
  - b) centimeters
  - c) Both 'a' and 'b'
  - d) None of these
- 160) Smaller electrode pores in a supercapacitor, increases the capacitance and power density and \_\_\_\_\_ the energy density.
- a) **increases**
  - b) decreases
  - c) Both 'a' and 'b'
  - d) None of these
- 161) Atmospheric pressure is equal to:
- a) 1.013 bar
  - b) 760mm of Hg
  - c) 101.3KN/m<sup>2</sup>
  - d) **All of these**
- 162) Carbon Nanotubes (CNTs) based Super Capacitor (SC) store about \_\_\_\_\_ charge as activated carbon-based SCs.

- a) Twice
  - b) Half
  - c) **Equal**
  - d) None of the above
- 163) When a synchronous motor is running at synchronous speed, the damper winding produces
- a) Damping torque.
  - b) Eddy current torque.
  - c) Torque aiding the developed torque.
  - d) **No torque.**
- 164) The solid base \_\_\_\_\_ KF/CaO can be used to convert Chinese tallow seed oil to biodiesel with yield of more than 95%.
- a) catalyst
  - b) **nano-catalyst**
  - c) Both 'a' and 'b'
  - d) None of these
- 165) In fuel cells, the particle size of Pt increases due to agglomeration at a \_\_\_\_ pH solution.
- a) **lower**
  - b) higher
  - c) Both 'a' and 'b'
  - d) None of these
- 166) TiO<sub>2</sub> is regarded as the most efficient and environmentally \_\_\_\_ photocatalyst.
- a) **friendly**
  - b) harmful
  - c) Both 'a' and 'b'
  - d) None of these
- 167) Conductive polymers are generally \_\_\_\_\_ in nature.
- a) **non-plastic**
  - b) plastic
  - c) Both 'a' and 'b'
  - d) None of these
- 168) The Organic LED has a brighter, higher contrast display but with \_\_\_\_ response times.
- a) **faster**
  - b) slower
  - c) Both 'a' and 'b'
  - d) None of these
- 169) An Organic LED consists of \_\_\_\_\_ layers that all play a role in making the Organic LED well-structured and energy efficient.
- a) Four
  - b) Five
  - c) **Six**
  - d) Seven

- 170) \_\_\_\_\_ display is self-illuminating because of its organic material.
- a) LED
  - b) **Organic LED's**
  - c) Both 'a' and 'b'
  - d) None of these
- 171) Burning of \_\_\_\_\_ is source of global warming.
- a) Fossil fuels
  - b) Coal
  - c) **Both 'a' and 'b'**
  - d) None of these
- 172) \_\_\_\_\_ amount of the electricity of the United States is generated by coal.
- a) **Small**
  - b) Large
  - c) Both 'a' and 'b'
  - d) None of these
- 173) Clean Coal Technology seeks to reduce harsh environmental effects by using technologies to clean coal and contain its \_\_\_\_\_.
- a) products
  - b) emissions
  - c) **Both 'a' and 'b'**
  - d) None of these
- 174) Solidified carbon, a coal derivative, is called \_\_\_\_\_.
- a) Char
  - b) **Coke**
  - c) Tar
  - d) None of these
- 175) **Exajoule** is equal to \_\_\_\_\_ joules.
- a)  $10^{15}$
  - b)  **$10^{18}$**
  - c)  $10^{21}$
  - d) None of the above
- 176) Indirect route and the direct route are processes of:
- a) FT processes
  - b) Coal gasification
  - c) **Coal liquefaction**
  - d) Both 'b' & 'c'
- 177) To make liquid fuels from natural gas, from Coal to Liquid (CTL), we need to \_\_\_\_\_ hydrogen and add carbon.
- a) **inject**
  - b) reject
  - c) Both 'a' and 'b'
  - d) None of these

- 178) Hydrogen is required to increase the H/C ratio of coal as it is \_\_\_\_.
- a) **increase**
  - b) reduce
  - c) Both 'a' and 'b'
  - d) None of these
- 179) Coal dissolution is accomplished at \_\_\_\_\_:
- a) ~300 °C
  - b) ~350 °C
  - c) **~400 °C**
  - d) ~450 °C
- 180) DCL products contain an overall \_\_\_\_\_ hydrogen content.
- a) **Lower**
  - b) Higher
  - c) Equal
  - d) None of the above
- 181) Slurry is mixed with H<sub>2</sub> in the Exxon Donor Solvent (EDS) process, preheated and fed to a simple up-flow tubular reactor that operates at \_\_\_\_\_:
- a) 400-425 °C
  - b) **425-450 °C**
  - c) 450-475 °C
  - d) None of the above
- 182) The essential ingredient of all the synthesis gases is:
- a) Oxygen
  - b) **Hydrogen**
  - c) Nitrogen
  - d) Carbondioxide
- 183) The reactor used in the H-coal process operates at a pressure of \_\_\_\_\_.
- a) 2700 psig
  - b) 2800 psig
  - c) **2900 psig**
  - d) 3000 psig
- 184) Indirect coal liquefaction involves \_\_\_\_\_ steps.
- a) **Two**
  - b) Three
  - c) Four
  - d) None of the above
- 185) Complete breakdown of the coal structure by gasification is the \_\_\_ step in Coal to Liquid (CTL).
- a) **major**
  - b) minor
  - c) Both 'a' and 'b'
  - d) None of these



- 186) Theoretical efficiency of Coal to Liquid (CTL) is approximately \_\_\_\_\_.  
a) **55-75%**  
b) 55-65%  
c) Both 'a' and 'b'  
d) None of these
- 187) Gasoline containing \_\_\_\_ octane is considered as very low octane.  
a) 30%  
b) **40%**  
c) 50%  
d) None of these
- 188) Conversion of synthesis gas to hydrocarbons is exothermic.  
a) endothermic  
b) **exothermic**  
c) Both 'a' and 'b'  
d) None of these
- 189) Carbon dioxide can be more readily \_\_\_\_ from the flue gas stream when gasification products are combusted.  
a) added  
b) **removed**  
c) Both 'a' and 'b'  
d) None of these
- 190) Hydrogen from gasification can also be reacted with carbon at \_\_\_\_ pressures by the carbon hydrogenation or hydrogasification reaction.  
a) **high**  
b) low  
c) equal  
d) None of these
- 191) The temperatures developed in the fuel bed during gasification can be very high.  
a) **high**  
b) low  
c) Both 'a' and 'b'  
d) None of these
- 192) The main difference is that in Underground Coal Gasification (UCG), the actual process takes place \_\_\_\_\_.  
a) **underground**  
b) above ground  
c) Both 'a' and 'b'  
d) None of these
- 193) There are \_\_\_\_ ways of obtaining liquids from coal.  
a) 2  
b) **3**

- c) 4  
d) None of these
- 194) The energy produced from Underground Coal Gasification (UCG) is in the form of:  
a) **Syngas**  
b) Pure Hydrogen  
c) Carbon monoxide and dioxide  
d) None of these
- 195) The difference between pyrolysis and gasification take place at the \_\_\_\_\_ temperature but the amount of oxygen used in both processes is different.  
a) **Same**  
b) lower  
c) higher  
d) None of these
- 196) The angle between the vertical and the line of the sun, that is, the angle of incident on a horizontal surface is called as:  
a) Solar azimuth angle  
b) Solar altitude angle  
c) **Zenith angle**  
d) None of these
- 197) About \_\_\_\_\_ gas can be produced per 100 kg of coal.  
a) 25 m<sup>3</sup>  
b) **35 m<sup>3</sup>**  
c) 45 m<sup>3</sup>  
d) 30 m<sup>3</sup>
- 198) Which of the following is involved in coal gasification?  
a) **Heat and mass transfer**  
b) **Complex flow dynamics**  
c) Decreasing cavity dimensions  
d) All of the above
- 199) Underground Coal Gasification (UCG) requires no capital cost of the surface \_\_\_\_\_ reactor.  
a) Pyrolysis  
b) **Gasification**  
c) Combustion  
d) None of these
- 200) The seam for \_\_\_\_\_ lies underground.  
a) **Underground Coal Gasification (UCG)**  
b) Gasification  
c) Pyrolysis  
d) None of these
- 201) UCG has \_\_\_\_\_ and visual problems as the process takes place underground.

- a) **acoustic**
  - b) odor
  - c) Both 'a' and 'b'
  - d) None of these
- 202) \_\_\_\_\_ different methods of Underground Coal Gasification (UCG) have evolved.
- a) **Two**
  - b) Three
  - c) Four
  - d) None of the above
- 203) UCG offers enhanced potential for Carbon Captured Sequestration (CCS).
- a) Gasification
  - b) **Underground Coal Gasification (UCG)**
  - c) Both 'a' and 'b'
  - d) None of these
- 204) Biological underground coal gasification \_\_\_\_\_ be used underground.
- a) **can**
  - b) cannot
  - c) Both 'a' and 'b'
  - d) None of these
- 205) High temperatures are favored for biological underground coal gasification which \_\_\_\_\_ the rate of reaction.
- a) **increases**
  - b) decreases
  - c) Both 'a' and 'b'
  - d) None of these
- 206) One of the advantages of Underground Coal Gasification (UCG) is the formation of \_\_\_\_\_.
- a) by products
  - b) chemicals
  - c) **Both 'a' and 'b'**
  - d) None of these
- 207) Carbon Captured Sequestration (CCS) is often regarded as a means of mitigating \_\_\_\_\_ usage.
- a) **fossil fuels**
  - b) chemicals
  - c) Both 'a' and 'b'
  - d) None of these
- 208) CCS can be carried out in \_\_\_\_\_ steps.
- a) one
  - b) Two
  - c) **Three**
  - d) Four

- 209) The \_\_\_\_\_ of pre-combustion removal of carbon from coal is that it reduces the heating value of the fuel.
- a) **advantage**
  - b) disadvantage
  - c) Both 'a' and 'b'
  - d) None of these
- 210) In post-combustion, \_\_\_\_\_ is removed from a power station's output after a fuel has been burned.
- a) **carbon dioxide**
  - b) carbon monoxide
  - c) Both 'a' and 'b'
  - d) None of these
- 211) Waste gases in pre-combustion \_\_\_\_\_ captured and scrubbed clean before they travel up smokestacks.
- a) **are not**
  - b) are
  - c) Both 'a' and 'b'
  - d) None of these
- 212) Scrubbing of waste gases is done by passing them over an absorbent such as a \_\_\_\_.
- a) **porous surface**
  - b) rigid surface
  - c) solid surface
  - d) None of these
- 213) \_\_\_\_\_ is a complex mixture of Hydrocarbon (H, C) compound with major amounts of nitrogen, oxygen and sulphur.
- a) **petroleum**
  - b) hydrogen
  - c) methane
  - d) None of these
- 214) The discovery of petroleum can be dated to as back as the mid of \_\_\_\_\_ century.
- a) 17<sup>th</sup>
  - b) 18<sup>th</sup>
  - c) **19<sup>th</sup>**
  - d) 20<sup>th</sup>
- 215) Camphene is soluble in \_\_\_\_\_.
- a) Water
  - b) inorganic solvents
  - c) **organic solvents**
  - d) all of the above

- 216) At the beginning of the \_\_\_\_ century the sales of kerosene exceeded that of gasoline due to the popularity of kerosene lamps.
- a) 20<sup>th</sup>
  - b) **19<sup>th</sup>**
  - c) 21<sup>st</sup>
  - d) None of these
- 217) Kerosene falls in the range of up to \_\_\_\_\_.
- a) C10
  - b) C15
  - c) **C20**
  - d) None of the above
- 218) Sulfur compounds can \_\_\_\_\_ the fuels heat capacity.
- a) **decrease**
  - b) increase
  - c) Both 'a' and 'b'
  - d) None of these
- 219) A complex combination of hydrocarbons consisting predominantly of \_\_\_\_\_ and \_\_\_\_\_ hydrocarbons.
- a) **Aliphatic**
  - b) non-cyclic
  - c) aromatic
  - d) **non-aromatic**
- 220) Flashpoint the temperature that vapors that may be ignited.
- a) **highest**
  - b) lowest
  - c) Both 'a' and 'b'
  - d) None of these
- 221) Low explosion Level (LEL) and Upper Explosion Level (UEL) are limits to be considered for a fuel to catch \_\_\_\_\_.
- a) vapors
  - b) **fire**
  - c) Both 'a' and 'b'
  - d) None of these
- 222) Vapor Pressure is the pressure exerted by a vapor at a given \_\_\_\_\_ in a closed system.
- a) **temperature**
  - b) volume
  - c) pressure
  - d) None of these
- 223) Toxicity is the degree to which a substance can damage \_\_\_\_\_.
- a) Human
  - b) Skin

- c) **Organism**  
d) organ
- 224) Petroleum geology is very largely concerned with the study of \_\_\_\_\_.  
a) petroleum underground  
b) underground morphology  
c) **sedimentary rocks**  
d) none of the above
- 225) The first petroleum fields were discovered near \_\_\_\_\_.  
a) Cracks  
b) **oil seepages**  
c) sedimentary rocks  
d) all of these
- 226) Oil is \_\_\_\_\_ than water.  
a) **lighter**  
b) heavier  
c) Both 'a' and 'b'  
d) None of these
- 227) The study of the information revealed by the boreholes already drilled showed that oil accumulations could be found by tracing lateral changes in:  
a) rocks  
b) **locating breaks**  
c) oils seeps  
d) all of these
- 228) The chief advantage of the Geophysical tools is that they allow the operator to \_\_\_\_\_ below breaks in the geological sequence.  
a) Guess  
b) **See**  
c) Observe  
d) extrapolate
- 229) This technique is called \_\_\_\_\_ which is field survey conduct consist of magnetic field, gravity field, seismic reflection.  
a) Subsurface morphology  
b) Survey  
c) **Geophysics**  
d) None of these
- 230) Which of the following components are required in data acquisition system:  
a) the source  
b) the detector  
c) the recording equipment  
d) **All of these**
- 231) The first drilling well for exploration we call it \_\_\_\_\_ well.  
a) wild dog

- b) **wildcat**
  - c) initial
  - d) first wild
- 232) These waters evolve with time as a result of water-rock interactions and gain high salinity.
- a) Meteoric waters
  - b) **Formation waters**
  - c) Juvenile waters
  - d) Mixed waters
- 233) \_\_\_\_\_ occurs between 50 C and 150 C.
- a) **Oil window**
  - b) Flash window
  - c) Extraction window
  - d) None of these
- 234) Where conductivity is high in sedimentary rocks, geothermal gradient will be \_\_\_\_\_.
- a) high
  - b) **low**
  - c) same
  - d) none of these
- 235) \_\_\_\_\_ of petroleum occurs over millions of years.
- a) Migration
  - b) **Maturation**
  - c) Degradation
  - d) All of these
- 236) During \_\_\_\_\_, the organic compounds are exposed to diverse thermal degradation reactions
- a) Diagenesis
  - b) **Catagenesis**
  - c) Metagenesis
  - d) None of these
- 237) \_\_\_\_\_, takes place at temperatures over 200°C.
- a) Diagenesis
  - b) Catagenesis
  - c) **Metagenesis**
  - d) None of these
- 238) Most petroleum is formed during the \_\_\_\_\_ and \_\_\_\_\_ of the residual biogenic organic matter.
- a) Diagenesis
  - b) **Catagenesis**
  - c) Catalysis
  - d) None of these

- 239) \_\_\_\_\_ of petroleum occurs in two stage.
- Generation
  - Migration**
  - Degradation
  - None of these
- 240) Upon completion of migration of petroleum, the \_\_\_\_\_ decreases.
- Temperature
  - Pressure**
  - Volume
  - None of these
- 241) During the \_\_\_\_\_ stage, the gas and oil separate with the gas traveling ahead of oil. In most cases,
- First
  - Second**
  - Third
  - Fourth
- 242) The whole complex of operations necessary to construct wells of circular section applying \_\_\_\_\_ techniques.
- Excavation
  - Extraction
  - Both of these**
  - None of these
- 243) This seismic data also enables an estimate to be made of:
- Strategical sequences
  - Lithographical sequences
  - Both of these
  - None of these**
- 244) The first step of well drilling is:
- Seismic analysis
  - Well survey
  - Well proposal
  - None of these**
- 245) One of the main issues of well drilling is:
- Cost of drilling**
  - Complexity of the process
  - Nature of on-site surface
  - All of the above
- 246) Mud logging units are used for:
- Every well**
  - Complex wells
  - Deep wells
  - None of these
- 247) Mud logging units collect data through the implement of sensors:



- a) **Sensors**
  - b) Cameras
  - c) Flow ducts
  - d) None of these
- 248) Well abandonment heavily depends on the:
- a) **Ability of the well to be productive**
  - b) Economics of the whole process
  - c) Both of these
  - d) None of these
- 249) It is important to know how \_\_\_\_\_ varies within the reservoir because it will affect the flow of hydrocarbon during production.
- a) Porosity variation
  - b) **Permeability variation**
  - c) Facies changes
  - d) Hydrocarbon volumes
- 250) These traps are one of the most common to be found in extensional basins.
- a) traps
  - b) **Pinch-out traps**
  - c) Anticline traps
  - d) All of these
- 251) They form as a reservoir rock layer simply tapers off into a cap rock.
- a) Fault traps
  - b) **Pinch-out traps**
  - c) Anticline traps
  - d) None of these
- 252) Gas treatment facilities are designed to treat specific ratios of raw gas mixtures.
- a) **Ratios**
  - b) Amounts
  - c) Levels
  - d) None of these
- 253) Gas treatment plants are \_\_\_\_\_ shut down for maintenance.
- a) casually
  - b) **pre-planned**
  - c) both 'a' and 'b'
  - d) none of these
- 254) One of the general specifications of sales gas includes \_\_\_ heating value.
- a) minimum
  - b) **maximum**
  - c) equal
  - d) none of these
- 255) In long gas transmission pipes, the pressure is normally kept \_\_\_\_\_.

- a) low
  - b) high**
  - c) equal
  - d) none of these
- 256) Any hydrocarbons present in the sales gas may result \_\_\_\_\_.
- a) Beneficiary
  - b) Harmful**
  - c) Both 'a' and 'b'
  - d) None of these
- 257) The dewpoint temperature is the temperature at which either hydrocarbons or water \_\_\_\_\_ upon cooling of the gas.
- a) Liquifies
  - b) Condenses**
  - c) Solidifies
  - d) None of these
- 258) Acid gas is \_\_\_\_\_ soluble in water.
- a) Readily
  - b) Not**
  - c) Equally
  - d) None of these
- 259) Sales gas has a limit on its \_\_\_\_\_ contents.
- a) nonhydrocarbon**
  - b) hydrocarbons
  - c) both 'a' and 'b'
  - d) none of these
- 260) The characteristic curve of Triac explains that the breakover potential \_\_\_\_\_ as the gate current increases
- a) Increases
  - b) Decreases**
  - c) Constant
  - d) None
- 261) Which of the below mentioned thyristor stops regenerative latching function to speed up the turn off process
- a) Gate turn off thyristor
  - b) Static induction thyristor
  - c) Integrated gate commutated thyristor
  - d) Emitter turn off thyristor**
- 262) \_\_\_\_\_ Specifies the maximum forward voltage that can be withstand by the SCR at the time of working
- a) Peak forward blocking voltage**
  - b) Peak repetitive forward blocking voltage
  - c) Peak non-repetitive forward blocking voltage
  - d) On state voltage

- 263) The range of H<sub>2</sub>S in biogas lies from \_\_\_\_\_
- a) **50-5000 ppm**
  - b) 0.5-10 ppm
  - c) 0-5%
  - d) 5-10%
- 264) As the wind velocity in a wind turbine doubles, wind power becomes
- a) Double
  - b) Fourfold
  - c) **Eightfold**
  - d) None of these
- 265) For silicon solar cell, the energy needed to get an electron across a p-n junction is
- a) 1.0 eV
  - b) **1.1 eV**
  - c) 1.5 eV
  - d) 3.0 eV
- 266) Out of the following -----is not a renewable energy resource
- a) Hydel
  - b) Geo-thermal
  - c) Solar
  - d) **Natural gas**
- 267) The solar energy directly used for
- a) Drying
  - b) Water heating
  - c) Distillation
  - d) **All of these**
- 268) In the n-type semiconductor, the energy level is known as
- a) Acceptor level
  - b) valence level
  - c) **donor level**
  - d) forbidden level
- 269) Optical losses of solar collector \_\_\_\_\_ with the increase in temperature difference of pot content temperature and ambient temperature
- a) Increase
  - b) decrease
  - c) **remain the same**
  - d) depend on fluid
- 270) Which of the following fuel has the highest calorific value?
- a) Peat
  - b) Brown coal
  - c) Lignite
  - d) **Anthracite coal**

- 271) Which of the following power plant has the highest cost per kW installed?
- Steam power plant
  - Hydro-electric power
  - Gas turbine power plant
  - Nuclear power plant**
- 272) Once a transformer primary is energized from a square wave voltage source, its output voltage will be.
- A square wave.**
  - A sine wave
  - A triangular wave
  - A pulse wave
- 273) Heat transfer in liquid and gases takes place by
- Conduction
  - Conversion**
  - Radiation
  - conduction and convection
- 274) One Tons of Oil Equivalent (TOE) is approximately equal to
- 22 GJ
  - 32 GJ
  - 42 GJ**
  - 52 GJ
- 275) The unit of resistivity is
- $\Omega$
  - $\Omega/\text{meter}$
  - $\Omega\text{-meter}$**
  - $\Omega/\text{m}^2$
- 276) A Newtonian fluid is defined as the fluid which
- Obeys Hook's law
  - Is compressible
  - Obeys Newton's law of viscosity**
  - Is incompressible
- 277) Capacitor does not allow the sudden change of
- Power
  - Current
  - Voltage**
  - None of these
- 278) The following is indirect method of Solar energy utilization
- Wind energy
  - Biomass energy
  - Wave energy
  - All of the above**
- 279) General gas equation is\_

- a)  $PV=C_pRT$
  - b)  **$PV=nRT$**
  - c)  $PV = C$
  - d)  $PV=K_iRT$
- 280) Typical equipment for storm protection in a wind turbine is
- a) Breaks
  - b) Anemometer
  - c) Vibration sensors
  - d) **All of these**
- 281) Voltmeter used to measure
- a) Power
  - b) Current
  - c) **Voltage**
  - d) Speed
- 282) Goal of energy management practice is to
- a) Minimize energy cost
  - b) Minimum environmental effects
  - c) Maintain optimum energy procurement and utilization
  - d) **All of these**
- 283) For a generator, the resistance of the windings is known as
- a) **Internal resistance**
  - b) Generated resistance
  - c) Field resistance
  - d) Terminal resistance
- 284) Average solar global insolation in Pakistan lies from
- a)  $5-7 \text{ kJ m}^{-2} \text{ day}^{-1}$
  - b)  $5-7 \text{ kW m}^{-2} \text{ day}^{-1}$
  - c)  $5-7 \text{ kWh day}^{-1}$
  - d)  **$5-7 \text{ kWh m}^{-2} \text{ day}^{-1}$**
- 285) Photovoltaic (PV) or solar cells are often called as
- a) **Semiconductor**
  - b) Conductor
  - c) Insulator
  - d) None of these
- 286) Which material is used for the manufacturing of solar cells
- a) Copper
  - b) **Silicon**
  - c) Silver
  - d) Nano particles
- 287) A type of circuit which has only resistors is called
- a) Unilateral circuit
  - b) **Passive circuit**

- c) Active circuit
  - d) Bilateral circuit
- 288) The form of energy which is stored as latent heat is called
- a) **Thermal energy**
  - b) Chemical energy
  - c) Electrical energy
  - d) Mechanical energy
- 289) What is the basic component of the PV module
- a) Battery
  - b) **Solar cell**
  - c) Charge collector
  - d) All of the above
- 290) Solar thermal power generation can be achieved by
- a) Using focusing collector or heliostats.
  - b) Using a solar pond.
  - c) Using flat plate collector.
  - d) **All of the above.**
- 291) Which of the following quantities consists of SI unit as WATT
- a) Current
  - b) **Power**
  - c) Charge
  - d) Force
- 292) \_\_\_\_\_ is the voltage drop between the anode and cathode with specified junction temperature and ON-state forward current
- a) Anode voltage
  - b) Gate triggering voltage
  - c) Breakover voltage
  - d) **On state voltage**
- 293) If a thyristor operates under its repetitive voltage and current ratings, its maximum allowable temperature is never exceeded. But a SCR may fall into a abnormal operating condition due to fault in the circuit. \_\_\_\_\_ can be used to overcome this problem
- a) **Maximum surge current**
  - b) Maximum RMS current
  - c) Repetitive current
  - d) Average on-state current
- 294)  $(L) > I(H)$  represents \_\_\_\_\_
- a) Forward current
  - b) **Holding current**
  - c) Latching current
  - d) Gate current
- 295) Inductor and thyristor are used in series for \_\_\_\_\_ protection of SCR
- a)  $dv/dt$

- b) **di/dt**
- c) over-voltage
- d) over-current

296) In \_\_\_\_\_, reverse current continues to flow through the SCR after the anode current is decreased to zero. As this decaying current flows at a faster rate, due to inductance of the circuit, the high di/dt produces a high voltage which if crosses the SCR ratings will damage the SCR

- a) Forward breakover voltage
- b) **Internal over voltage**
- c) Reverse breakover voltage
- d) Voltage safety factor of SCR

297) In case of DC circuits during short circuit, fault current is limited by the source resistance. Therefore, the fault current is very large if the source impedance is very

- 
- a) **Low**
  - b) High
  - c) Constant
  - d) None

298) Time during which anode current rises from forward leakage current to 0.1 I(a) is called \_\_\_\_\_

- a) **Delay time**
- b) Rise time
- c) Spread time
- d) Turn-on time

299) If the turn-off time of thyristor is 10ms and reverse recovery time is 7ms, what will be the gate recovery time for thyristor?

- a) 17ms
- b) 1.4s
- c) 1.5ms
- d) **3ms**

300) If the input voltage of the single-phase converter are 85V, holding current = 5mA, inductance = 10mH and resistance = 10ohm. What will be the rate of rise of anode current at the time of triggering

- a) 850A/s
- b) **8500A/s**
- c) 1700A/s
- d) 17.9A/s

301) Ten thyristors are used in a string to withstand a dc voltage of  $V_s = 15\text{kV}$ . The maximum leakage current and recovery charge differences of thyristors are 10mA and 150uC. Each thyristor has voltage sharing resistance of  $R = 56\text{kohm}$  and capacitance of  $C_1 = 0.5\mu\text{F}$ . What will be the maximum steady state voltage sharing,  $V_{ds}(\text{max})$ ?

- a) 51900V
- b) 1502V
- c) **2004V**
- d) 3007V

302) Ten thyristors are used in a string to withstand a dc voltage of  $V_s = 15\text{kV}$ . The maximum leakage current and recovery charge differences of thyristors are  $10\text{mA}$  and  $150\mu\text{C}$ . Each thyristor has voltage sharing resistance of  $R = 56\text{k}\Omega$  and capacitance of  $C_1 = 0.5\mu\text{F}$ . What will be the steady state voltage derating factor?

- a) 97.2%
- b) 20%
- c) **25.1%**
- d) 51.2%

303) Which of the below mentioned power switches is fully controlled switch

- a) Diode
- b) SCR
- c) Triac
- d) **IGBT**

304) During turn-on of power switches, snubbers are used for

- a) **To minimize large over-currents**
- b) To minimize large over-voltages
- c) To minimize repetitive reverse currents
- d) None

305) Current transformer is a type of \_\_\_\_\_

- a) Supply
- b) Relay
- c) **Transducer**
- d) Breaker

306) In case of an ideal switch is closed, which of the below mentioned statement is true

- a)  $i(t) = 0$
- b)  **$v(t) = 0$**
- c)  $i(t) \& v(t) = 0$
- d) None

307) Lower the firing angle of a thyristor in a converter is, \_\_\_\_\_ is the power transferred to the load

- a) Lower
- b) **Higher**
- c) Constant
- d) None

308) Switched-mode converters are DC/DC converters that are fed from \_\_\_\_\_ networks and supply DC loads with a regulated output voltage

- a) **AC**
- b) DC
- c) Both AC/DC
- d) None

309) DC/DC converters provides barrier between input and output circuit are known as \_\_\_\_\_ converters



- a) Non-isolated
- b) Isolated**
- c) Point-of-Load
- d) Isolated/point-of-load

310) Zeta and Cuk converters are common types of \_\_\_\_\_ converters

- a) Isolated
- b) Non-isolated**
- c) AC/DC
- d) DC/AC

311) With a pure \_\_\_\_\_ load, in rectifiers, T1 and T2 conducts during (a to pi) and T3 and T4 conduct during (a+pi to 2pi)

- a) Inductive
- b) Capacitive
- c) Resistive**
- d) None

312) Consider a buck converter having  $R=2$  ohm,  $f_s=4$  kHz and  $D = 0.166$  (16.6%). On time of the switch of the converter will be

- a) 64.4ms
- b) 32.2us
- c) 49.2ms
- d) 41.5us**

313) If the dc converter has a resistive load of  $R = 10$ ohm and the input voltage is  $V_s = 220$ V. When converter switch remains on, its voltage drops is  $V_{ch} = 2$ V, the chopping frequency is  $f = 1$ kHz and duty cycle is 60%. The average output voltage  $V_a$  will be?

- a) 109V
- b) 131V**
- c) 123V
- d) 117V

314) If the dc converter has a resistive load of  $R = 15$ ohm and the input voltage is  $V_s = 220$ V. When converter switch remains on, its voltage drops is  $V_{ch} = 5$ V, the chopping frequency is  $f = 1$ kHz and duty cycle is 50%. The rms output voltage  $V_o$  will be?

- a) 152V**
- b) 154V
- c) 149V
- d) 151V

315) If the dc converter has a resistive load of  $R = 20$ ohm and the input voltage is  $V_s = 230$ V. When converter switch remains on, its voltage drops is  $V_{ch} = 3$ V, the chopping frequency is  $f = 1$ kHz and duty cycle is 60%. Input power of converter will be?

- a) 2398W
- b) 1566W**
- c) 763W
- d) 3132W

316) If the dc converter has a resistive load of  $R = 10\Omega$  and the input voltage is  $V_s = 220V$ . When converter switch remains on, its voltage drops is  $V_{ch} = 2V$ , the chopping frequency is  $f = 1kHz$  and duty cycle is 50%. Converter efficiency will be?

- a) 95.2%
- b) 96.4%
- c) 98.3%
- d) **99.1%**

317) If the buck-boost regulator has an input voltage of  $V_S = 12V$ . the duty cycle  $k = 0.25$  and the switching frequency is 25kHz. The inductance  $L = 150\mu H$  and filter capacitance  $C = 220\mu F$ . The average load current  $I_a = 1.25A$ . The average output voltage  $V_a$  will be?

- a) 3V
- b) -7V
- c) 1V
- d) **-4V**

318) \_\_\_\_\_ Indicates the amount of HD that remains in a particular waveform after the harmonics have been subjected to second-order attenuation through filter

- a) Harmonic factor
- b) Low order harmonic
- c) **Distortion factor**
- d) Harmonic factor of nth harmonic

319) Single-phase full bridge inverter can operate in \_\_\_\_\_ quadrants of VI graph

- a) 1
- b) 2
- c) 3
- d) **4**

320) The forward voltage drop of a power diode is  $V_d = 1.2V$  at  $I_d = 300A$ . Assuming that  $n = 2$  and  $V_t = 25.7mV$ . Reverse saturation current  $I(s)$  will be?

- a)  $1.1774 \times 10^{-4}A$
- b)  $2.3774 \times 10^{-6}A$
- c)  **$2.1774 \times 10^{-8}A$**
- d)  $3.2774 \times 10^{-7}A$

321) The reverse recovery time of diode is  $t_{rr} = 3\mu s$  and the rate of fall of the diode current is  $di/dt = 30A/\mu s$ . Storage charge  $Q_{rr}$  will be?

- a) 120uC
- b) **135uC**
- c) 150uC
- d) 178.34uC

322) If the buck-boost regulator has an input voltage of  $V_S = 12V$ . the duty cycle  $k = 0.25$  and the switching frequency is 25kHz. The inductance  $L = 150\mu H$  and filter capacitance  $C = 220\mu F$ . The average load current  $I_a = 1.25A$ . The peak to peak ripple current of inductor ( $\Delta I$ ) will be?

- a) 2A
- b) 0.6A
- c) **0.8A**

d) 1.3A

323) If the buck regulator has an input voltage of  $V_s = 12V$ . The required average output voltage is  $V_a = 5V$  at  $R = 500 \text{ ohm}$  and the peak-to-peak ripple voltage is  $20mV$ . The switching frequency is  $25kHz$ . If the peak to peak ripple current of inductor is limited to  $0.8A$ . The Filter inductance  $L$  will be?

- a) **146uH**
- b) 129uH
- c) 213uH
- d) 77uH

324) If the buck regulator has an input voltage of  $V_s = 12V$ . The required average output voltage is  $V_a = 5V$  at  $R = 500 \text{ ohm}$  and the peak-to-peak ripple voltage is  $20mV$ . The switching frequency is  $25kHz$ . If the peak to peak ripple current of inductor is limited to  $0.8A$ . The Filter capacitance  $C$  will be?

- a) 100uF
- b) **200uF**
- c) 400uF
- d) 280uF

325) \_\_\_\_\_ Elements are avoided in converters because they reduce efficiency

- a) **Resistive**
- b) Capacitive
- c) Inductive
- d) None

326) A \_\_\_\_\_ converts a constant voltage and frequency AC waveform to another AC waveform of a lower frequency by synthesizing the output waveform from segments of the AC supply without an intermediate DC link

- a) Inverter
- b) Chopper
- c) **Cycloconverter**
- d) AC Voltage Controller

327) Current is considered as state variable of inductor. For a finite \_\_\_\_\_ with an infinite inductance, the current must be constant

- a) **Voltage**
- b) Current
- c) Capacitance
- d) Inductance

328) What will be the inductor's energy if the inductance is  $3mH$  and current across the inductor is  $2A$

- a) 12mJ
- b) **6mJ**
- c) 3mJ
- d) 24mJ

329) What will be the capacitor's energy if the capacitance is 20 $\mu$ F and voltage across the capacitor is 3V

- a) 45 $\mu$ J
- b) 60 $\mu$ J
- c) 90 $\mu$ J**
- d) 105 $\mu$ J

330) Based on conduction theory in semiconductors, at \_\_\_\_\_ degree Kelvin temperature, few of the electrons in the valence band will acquire enough energy to jump in the conduction band

- a) 0
- b) 300**
- c) 27
- d) 98

331) In pure silicon, the concentration of holes is exactly equal to that of electrons and is called \_\_\_\_\_ concentration

- a) Intrinsic**
- b) Extrinsic
- c) None
- d) Substrate

332) A diode is composed of two \_\_\_\_\_ regions of P and N-Type material connected together

- a) Heterogeneous
- b) Homogeneous**
- c) Overlapped
- d) None

333) Drift current in the diode is generated due to the \_\_\_\_\_ charge carriers

- a) Majority
- b) Negative
- c) Positive
- d) Minority**

334) If the manufacturer of selected diode gives the rate of fall of diode current  $di/dt = 20\text{A}/\mu\text{s}$  and reverse recovery time of  $t_{rr} = 5\mu\text{s}$  with the stored charge  $Q_{rr} = 50\mu\text{C}$ . Peak reverse current will be

- a) 44.72A**
- b) 50A
- c) 57.6A
- d) 73.22A

335) Depletion region capacitance \_\_\_\_\_ in forward biased region due to decrease in depletion region

- a) Decreases
- b) Increases**
- c) Remains constant
- d) None

- 336) When diodes are connected in series, resultant diode's forward voltage \_\_\_\_\_
- Increases**
  - Decreases
  - Remains constant
  - None
- 337) When diodes are connected in parallel, circuit current carrying capacity \_\_\_\_\_
- Increases**
  - Decreases
  - Remain constant
  - None
- 338) Which of these FET uses reversed biased p-n junction to separate gate from body
- MOSFET
  - JFET**
  - IGBT
  - NOMFET
- 339) An n-MOS transistor composed of a lightly doped (small impurity) p-type base called
- P+ stopper
  - Bulk**
  - Body
  - N+ stopper
- 340) Neighboring transistors are insulated from each other with the aid of a thick layer of \_\_\_\_\_ and a reverse biased np-diode
- 2SiO<sub>2</sub>
  - SiO<sub>2</sub>**
  - GeO<sub>2</sub>
  - CO<sub>2</sub>
- 341) In MOSFET, a conduction channel is formed between source and drain when
- $V_{GS} > V_T$**
  - $V_{GS} < V_T$
  - $V_{GS} = V_{GD}$
  - $V_{DS} > V_{GS} - V_T$
- 342)  $V_{DS} < V_{GS} - V_T$  represents which region of the MOSFET's operation
- Cut-off
  - Linear**
  - Saturation
  - None
- 343) Current supplied to the \_\_\_\_\_ controls the amount of current that flows through the collector and emitter
- Emitter-collector
  - Collector-base
  - Emitter
  - Base**

- 344) The slope of \_\_\_\_\_ is called the Transfer Characteristic ( $\beta$ )
- $I_{CE}/I_{BE}$**
  - $I_{CB}/I_{BE}$
  - $I_C/I_B$
  - $I_E/I_B$
- 345) In comparison to transistors, thyristor has low \_\_\_\_\_ conduction losses
- Off state
  - On state**
  - On and off state
  - None
- 346) Which Laboratory was the first to fabricate a silicon-based thyristor
- Andrew
  - Kirchhoff
  - Bell**
  - Simon
- 347) Ohmic drop often refers to the potential induced by the \_\_\_\_\_ of the electrolyte or any other interface such as surface films or connectors
- Capacitance
  - Inductance
  - Resistance**
  - Reactance
- 348) SCR is a 3 terminal, \_\_\_\_\_ layer solid state semiconductor device, each layer consisting of alternately N-type or P-type material
- 2
  - 3
  - 4**
  - 5
- 349) Which of these options is the minimum anode current required to maintain the thyristor in the off-state
- Latching current
  - Holding current**
  - Reverse current
  - None
- 350) Which of these options is the maximum reverse voltage that can be applied on SCR without conducting in the reverse direction
- Peak reverse voltage**
  - Forward breakover voltage
  - Reverse leakage voltage
  - None
- 351) Two transistors model demonstrate which of these actions due to positive feedback in the thyristor
- Regenerative
  - Latching

- c) **Regenerative/Latching**
- d) None

352) Mathematical equation of the collector current  $I_C$  of a transistor is

- a)  **$I_C = \alpha I_E + I_{CBO}$**
- b)  $I_C = \alpha I_B + I_{CBO}$
- c)  $I_C = \alpha I_E + I_C$
- d)  $I_C = \alpha I_E + I_B$

353) If a thyristor is in the blocking state and a rapidly rising voltage is applied to the device, \_\_\_\_\_ currents would flow through the junction capacitors

- a) Zero
- b) Small
- c) **High**
- d) Leakage

354) Typical ratings of thyristor are \_\_\_\_, which responds to high power handling capacity

- a) 1.5A & 10V
- b) 1.5A & 10kV
- c) 1.5MA & 10MV
- d) **1.5kA & 10kV**

355) In case of an ideal switch is closed, which of the below mentioned statement is true

- a)  $i(t) = 0$
- b)  **$v(t) = 0$**
- c)  $i(t) \& v(t) = 0$
- d) None

356) DC/DC converters provides barrier between input and output circuit are known as \_\_\_\_\_ converters

- a) Non-isolated
- b) **Isolated**
- c) Point-of-arrester
- d) Isolated/point-of-load

357) With a pure \_\_\_\_\_ load, in rectifiers, T1 and T2 conducts during (a to pi) and T3 and T4 conduct during (a+pi to 2pi)

- a) Inductive
- b) Capacitive
- c) **Resistive**
- d) None

358) Consider a buck converter having  $R=2$  ohm,  $f_s=4$  KHz and  $D = 16.6\%$ . Off time of the switch of the converter will be

- a) 64.4ms
- b) **208-5us**
- c) 166.2ms
- d) 41.5us

359) \_\_\_\_\_ Indicates the amount of HD that remains in a particular waveform after the harmonics have been subjected to second-order attenuation through filter

- a) Harmonic factor
- b) Low order harmonic
- c) **Distortion factor**
- d) Harmonic factor of nth harmonic

360) In case there is no dc current flowing through the transformer of single-phase full wave rectifier, the average output voltages will be

- a) 0.436Vm
- b) 0.45Vm
- c) 0.23Vm
- d) **0.636Vm**

361) Single-phase full wave rectifier can operate in \_\_\_\_\_ quadrants

- a) 1
- b) **2**
- c) 3
- d) 4

362) If the dc converter has a resistive load of  $R = 10\text{ohm}$  and the input voltage is  $V_s = 220\text{V}$ . When converter switch remains on, its voltage drops is  $V_{ch} = 2\text{V}$ , the chopping frequency is  $f = 1\text{kHz}$  and duty cycle is 60%. The average output voltage  $V_a$  will be?

- a) 109V
- b) **131V**
- c) 123V
- d) 117V

363) If the dc converter has a resistive load of  $R = 15\text{ohm}$  and the input voltage is  $V_s = 220\text{V}$ . When converter switch remains on, its voltage drops is  $V_{ch} = 5\text{V}$ , the chopping frequency is  $f = 1\text{kHz}$  and duty cycle is 50%. The rms output voltage  $V_o$  will be?

- a) **152V**
- b) 154V
- c) 149V
- d) 151V

364) If the dc converter has a resistive load of  $R = 10\text{kohm}$  and the input voltage is  $V_s = 220\text{V}$ . When converter switch remains on, its voltage drops is  $V_{ch} = 2\text{V}$ , the chopping frequency is  $f = 1\text{kHz}$  and duty cycle is 50%. Output power of converter will be?

- a) 13.7W
- b) 136.2W
- c) **2.37W**
- d) 1.9kW

365) If the dc converter has a resistive load of  $R = 20\text{ohm}$  and the input voltage is  $V_s = 230\text{V}$ . When converter switch remains on, its voltage drops is  $V_{ch} = 3\text{V}$ , the chopping frequency is  $f = 1\text{kHz}$  and duty cycle is 60%. Input power of converter will be?

- a) 2398W
- b) **1566W**
- c) 763W



d) 3132W

366) If the dc converter has a resistive load of  $R = 10\text{ohm}$  and the input voltage is  $V_s = 220\text{V}$ . When converter switch remains on, its voltage drops is  $V_{ch} = 2\text{V}$ , the chopping frequency is  $f = 1\text{kHz}$  and duty cycle is 50%. Converter efficiency will be?

- a) 95.2%
- b) 96.4%
- c) 98.3%
- d) **99.1%**

367) If the buck regulator has an input voltage of  $V_s = 12\text{V}$ . The required average output voltage is  $V_a = 5\text{V}$  at  $R = 500\text{ohm}$  and the peak-to-peak ripple voltage is  $20\text{mV}$ . The switching frequency is  $25\text{kHz}$ . If the peak to peak ripple current of inductor is limited to  $0.8\text{A}$ . The duty cycle  $k$  will be?

- a) 33.54%
- b) 49.23%
- c) **41.67%**
- d) 58.22%

368) If the buck regulator has an input voltage of  $V_s = 12\text{V}$ . The required average output voltage is  $V_a = 5\text{V}$  at  $R = 500\text{ohm}$  and the peak-to-peak ripple voltage is  $20\text{mV}$ . The switching frequency is  $25\text{kHz}$ . If the peak to peak ripple current of inductor is limited to  $0.8\text{A}$ . The Filter inductance  $L$  will be?

- a) **146uH**
- b) 129uH
- c) 213uH
- d) 77uH

369) If the buck regulator has an input voltage of  $V_s = 12\text{V}$ . The required average output voltage is  $V_a = 5\text{V}$  at  $R = 500\text{ohm}$  and the peak-to-peak ripple voltage is  $20\text{mV}$ . The switching frequency is  $25\text{kHz}$ . If the peak to peak ripple current of inductor is limited to  $0.8\text{A}$ . The Filter capacitance  $C$  will be?

- a) 100uF
- b) **200uF**
- c) 400uF
- d) 280uF

370) If the buck-boost regulator has an input voltage of  $V_S = 12\text{V}$ . the duty cycle  $k = 0.25$  and the switching frequency is  $25\text{kHz}$ . The inductance  $L = 150\text{uH}$  and filter capacitance  $C = 220\text{uF}$ . The average load current  $I_a = 1.25\text{A}$ . The average output voltage  $V_a$  will be?

- a) 3V
- b) -7V
- c) 1V
- d) **-4V**

371) If the buck-boost regulator has an input voltage of  $V_S = 12\text{V}$ . the duty cycle  $k = 0.25$  and the switching frequency is  $25\text{kHz}$ . The inductance  $L = 150\text{uH}$  and filter capacitance  $C = 220\text{uF}$ . The average load current  $I_a = 1.25\text{A}$ . The peak to peak ripple current of inductor ( $\Delta I$ ) will be?

- a) 2A

- b) 0.6A
- c) 0.8A**
- d) 1.3A

372) State space is a \_\_\_\_\_ model of physical system as a set of input, output and state variables related by different equations

- a) Mathematical**
- b) Analysis
- c) Design
- d) None

373) If a general, simple static artificial ith neuron has n inputs and these are  $x(1), x(2) \dots x(n)$ , and its output is a scalar quantity  $y(i)$  and the connection weights between the ith neuron and the inputs are  $w(i1), w(i2) \dots, w(in)$ , then the neuron output is obtained as

- a)  $y_i = f_i(w_{(ij)} * x_{(j)} + b_{(i)})$
- b)  $y_i = f_i(\sum w_{(ij)} * x_{(j)})$
- c)  $y_i = f_i(\sum w_{(ij)} * x_{(j)} - b_{(i)})$
- d)  $y_i = f_i(\sum w_{(ij)} * x_{(j)} + b_{(i)})$**

374) In \_\_\_\_\_ technique, a steepest descent approach is used to minimize the prediction error with respect to the connection weights in the NN

- a) Feedforward
- b) Back propagation**
- c) Anticipation
- d) None

375) Feed forward networks are also known as \_\_\_\_\_ organization

- a) Top-up
- b) Bottom down
- c) Bottom-up**
- d) None

376) An integral control ( $K_i$ ) will have the effect of eliminating the \_\_\_\_\_

- a) Rise time
- b) Steady state error**
- c) Overshoot
- d) Stability

377) Fuzzy logic is a form of \_\_\_\_\_ logic

- a) Many-valued**
- b) Two-valued
- c) Binary set
- d) Crisp set

378) Switched reluctance motor is a type of \_\_\_\_\_ motor

- a) DC**
- b) AC
- c) Shunt
- d) Induction

- 379) Three phase half wave converter dc drive works in \_\_\_\_\_ quadrant
- First**
  - Second
  - First and fourth
  - All four
- 380) Shunt DC motor speed can be controlled by controlling the \_\_\_\_\_
- Field voltage
  - Armature voltage**
  - Magnetic field
  - None
- 381) In practice, for a speed less than the base speed in shunt dc motor, \_\_\_\_\_ are maintained constant to meet the torque demand
- Armature voltage and field voltage
  - Armature current and field voltage
  - Armature current and field current**
  - Armature voltage and field current
- 382) \_\_\_\_\_ Function will be carried out when Back emf  $E_g$  is less than supply voltage
- Motoring**
  - Dynamic braking
  - Regenerative braking
  - Plugging
- 383) For a series motor, in \_\_\_\_\_ either the armature terminals or field terminals should be reversed, but not both
- Motoring
  - Dynamic braking
  - Regenerative braking
  - Plugging**
- 384) \_\_\_\_\_ is a four-quadrant drive and permits four modes of operation
- Single phase half wave converter drive
  - Single phase full wave converter drive
  - Single phase dual wave converter drive**
  - None
- 385) The speed and torque of induction motors can be controlled by
- Stator current and rotor voltage
  - Stator and rotor voltage**
  - Rotor current and frequency
  - None
- 386) If the stator frequency is 50Hz, number of poles are 4 and slip is 0.2, what will be the rotor speed (rpm) of three-phase induction motor
- 1600
  - 1400
  - 1200**
  - 1000

- 387) The values of the set membership is represented by \_\_\_\_\_
- a) Discrete truth
  - b) Degree of truth**
  - c) Probabilities
  - d) Actual Values
- 388) The derivative control action is typically used when controlling \_\_\_\_\_, but rarely used when controlling \_\_\_\_\_
- a) Temperature, flow**
  - b) Flow, level
  - c) pH, temperature
  - d) Level, temperature
- 389) As soon as wind motion is created, a deflective force named \_\_\_\_\_ force takes place due to the rotation of the earth, which changes the direction of motion
- a) Strike
  - b) Coriolis**
  - c) Motive
  - d) Maxwell
- 390) Which option best represents the vertical axis wind turbine type
- a) Darrieus
  - b) Giromill
  - c) Savonius
  - d) All of these**
- 391) Wind turbine tower must be at least \_\_\_\_\_ high to avoid turbulence caused by buildings and trees
- a) 25-30m**
  - b) 10-15m
  - c) 35-38m
  - d) None
- 392) \_\_\_\_\_ states that the product of pressure and volume of a gas at a constant temperature must be constant
- a) Boyle's Law**
  - b) Bernoulli's Principle
  - c) Charles Law
  - d) None
- 393) A three-blade turbine having wind speed threshold limit of 20m/s with a rotor diameter of 54m, wind speed of 3.7m/s and power coefficient = 0.51, captured power will be \_\_\_\_\_
- a) 15.2MW
  - b) 23.8MW
  - c) 7.61MW
  - d) None of these**

394) In a multiple stages gearbox system, if a 36Teeth gear is being driven by a 12Teeth gear on an arm and another 60teeth gear is being driven by that 36teeth gear, the resulting gear ratio of overall gear train will be \_\_\_\_\_

- a) 15:1
- b) 3:1
- c) 5:1**
- d) 5:3

395) Consider a gearbox with 4 gears having gear teeth of 30T, 20T, 10T and 60T respectively. the resulting gear ratio of overall gear train will be \_\_\_\_\_

- a) 3:1
- b) 2:1**
- c) 5:1
- d) 7:1

396) In downwind WT, the direction of wind flow is from

- a) blade to tail vane
- b) tail vane to blade**
- c) tail vane to axis
- d) None of these

397) Induction machines are somewhat \_\_\_\_\_ in their dynamic response to changing conditions than the synchronous machines

- a) softer**
- b) difficult
- c) uncontrolled
- d) None of these

398) Operation of WT in variable speed may cause damage to \_\_\_\_\_ due to harmonics

- a) Bearings
- b) Electrical insulation
- c) Data Signal loss
- d) All of these**

399) In DFIG, RSC controls the \_\_\_\_\_ of Generator

- a) DC link voltage
- b) AC side reactive power
- c) Torque**
- d) DC link voltage & torque

400) Consider the use of a 10 hp, 1760 r/min, 440 V, three-phase induction motor as an asynchronous generator. The full-load current of the motor is 8 A and the full-load power factor is 0.8. Reactive power will be \_\_\_\_\_

- a) 7612 VAR
- b) 3654 VAR**
- c) 4567 VAR
- d) 5645 VAR

- 401) Consider the use of a 12 hp, 1760 r/min, 440 V, frequency = 50Hz, three-phase induction motor as an asynchronous generator. The full-load current of the motor is 13A and the full-load power factor is 0.95. Minimum capacitance per phase will be \_\_\_\_\_
- 21mF
  - 28mF
  - 17mF**
  - 10mF
- 402) The water cycle involves the exchange of energy, which leads to \_\_\_\_\_ changes
- Water quantity
  - Temperature**
  - Mineral
  - None of these
- 403) If hydropower was replaced with coal burning for energy production, unto \_\_\_\_\_ of additional greenhouse gases would be emitted per year
- 100 million tonnes
  - 2 billion tonnes
  - 4000 million tonnes**
  - None of these
- 404) for every 100 unit of energy needed to coal plant, output will be approx \_\_\_\_\_
- 55 units
  - 10 units
  - 35 units**
  - 95 units
- 405) The water cycle involves the exchange of energy, which leads to \_\_\_\_\_ changes
- Water quantity
  - Temperature**
  - Mineral
  - None of these
- 406) Based on the shape of dam, it may be categorized into \_\_\_\_\_ types
- 2
  - 3**
  - 4
  - None of these
- 407) A structure built to support the lateral pressure of an arch or span is called \_\_\_\_\_
- Abutment**
  - Buttress
  - Gravity
  - Embankment
- 408) \_\_\_\_\_ of dams in the world are of embankment type
- 75%**
  - 50%
  - 80%
  - 60%

409) Waterproofing is often provided by a central part made of compacted earth called a

- a) Transition filter
- b) Internal drain
- c) Toe
- d) **Core**

410) A rockfill layer on the upstream facing, called \_\_\_\_\_, protects against wave action.

- a) **Riprap**
- b) Relief well
- c) Toe
- d) Free board

411) \_\_\_\_\_ draft tube has an advantage that its conical portion at the center reduces the whirl action of water moving with high velocity centre reduces

- a) Conical
- b) **Moody**
- c) Elbow type
- d) None of these

412) A rockfill layer on the upstream facing, called \_\_\_\_\_, protects against wave action.

- a) **Riprap**
- b) B. Relief well
- c) Toe
- d) Free board

413) Pelton turbines are used in \_\_\_\_\_ head plants

- a) **High**
- b) B. Low
- c) C. Medium
- d) D. None of these

414) \_\_\_\_\_ turbines are the subtypes of reaction turbines

- a) **Starflo, tube**
- b) B. Starflo, turgo
- c) C. Francis, Pelton
- d) D. Pelton, Crossflow

415) Turgo tubings have efficiency of \_\_\_\_\_

- a) 95%
- b) **87%**
- c) 82%
- d) 93%

416) Francis turbines based on the flow of directions are called as \_\_\_\_\_

- a) **Radial inward**
- b) Axial flow
- c) Tangential flow
- d) All of these

- 417) Losses in hydropower systems are due to \_\_\_\_\_
- Frictional drag & flow turbulence
  - Friction & magnetic losses
  - Both of these**
  - None of these
- 418) In normal operating conditions, keeping the \_\_\_\_\_ and the \_\_\_\_\_ constant, the output may vary by adjusting the \_\_\_\_\_
- Head, speed, discharge**
  - Head, discharge, load
  - Head, output, gate opening
  - Speed, discharge, load
- 419) A turbine is to operate under a head of 25 m at 180 rpm. The discharge is 10 cumec. If the efficiency is 90%, the speed of the turbine under a head of 20 m will be \_\_\_\_\_
- 130rpm
  - 176rpm
  - 161rpm**
  - 193rpm
- 420) A turbine is to operate under a head of 25 m at 180 rpm. The discharge is 10 cumec. If the efficiency is 90%, the discharge of the turbine under a head of 20 m will be \_\_\_\_\_
- 7.94cumcec
  - 8.94cumec**
  - 9.94cumec
  - 6.94cusec
- 421) A turbine is to operate under a head of 25 m at 180 rpm. The discharge is 353 cusec. If the efficiency is 90%, the output power of the turbine will be \_\_\_\_\_
- 45.7MW
  - 77.9MW
  - 1.506MW
  - 2.207MW**
- 422) A turbine is to operate under a head of 25 m at 180 rpm. The discharge is 10 cumec. If the efficiency is 90%, the discharge of the turbine under a head of 20 m will be \_\_\_\_\_
- 7.94cumcec
  - 8.94cumec**
  - 9.94cumec
  - 6.94cusec
- 423) Consider a mountain stream with an effective head of 25m and a flow rate of 10litre per second. Output power of a hydro plant will be \_\_\_\_\_, if the plant efficiency is 83%.
- 21kW
  - 0.02kW
  - 2.1kW**
  - 0.2kW



424) Consider a site (Niagra falls) with an effective head of 100m and a flow rate of 211,888 cusec. Output power of plant will be \_\_\_\_\_, if the plant efficiency is 90%.

- a) **5.4GW**
- b) 190GW
- c) 4.98GW
- d) Not applicable

425) Consider a site (Niagra falls) with an effective head of 100m and a flow rate of 211,888 cusec. Energy it generates will be \_\_\_\_\_, if the plant efficiency is 90%.

- a) 43.6TWh
- b) **47.3TWh**
- c) 1664.4TWh
- d) None of these

426) Consider a site with an effective head of 80m and a flow rate of 4000 cusec and the plant efficiency is 90%. Keeping in consideration the average use of energy per person is 4000kWh, About how many people the generated energy will support.

- a) 1.2million
- b) 1.0million
- c) **0.6million**
- d) 0.2million

427) Which of the following is not a requirement for site selection of hydroelectric power plant.

- a) Availability of water
- b) Large catchment area
- c) Rocky land
- d) **Sedimentation**

428) Hydroelectric power plant is \_\_\_\_\_ source of energy

- a) Non-renewable
- b) **Conventional**
- c) Non-conventional
- d) Continuous

429) Hydroelectric power plant is mainly located in \_\_\_\_\_

- a) Flat areas
- b) Deserts
- c) **Hilly areas**
- d) Deltas

430) Which statement about hydroelectric power plant is wrong?

- a) Efficiency of hydroelectric power plant does not reduce with age
- b) Its construction cost is very high and takes a long time for erection
- c) it is very neat and clean plant because no smoke or ash is produced
- d) **Meeting rapidly changing load demands is not possible in hydroelectric power plant**

431) The location of surge tank is close to \_\_\_\_\_

- a) Tail race

- b) Dam
- c) Turbine gate**
- d) Spillway

432) The maximum limited head for a Kaplan turbine is \_\_\_\_\_

- a) 30m**
- b) 50m
- c) 100m
- d) 75m

433) The bulb turbines are mainly \_\_\_\_\_

- a) High speed turbines
- b) High head and axial flow turbines
- c) Low head and axial flow turbines**
- d) High pressure turbine

434) Dam having very wide base as compared to its height is called \_\_\_\_\_

- a) buttress dam
- b) arch dam
- c) earth dam**
- d) solid gravity dam

435) Latent heat of vaporization of water at atmospheric pressure is .....

- a) 2257 kJ/kg**
- b) 4.187 kJ/Kg/K
- c) 335 kJ/kg
- d) 210 kJ/kg/K

435) An ice plant produces 10 tonnes of ice per day at 0°C using water at room temperature of 20°C. The theoretical refrigerator capacity (TR) of the plant will be .....

- a) 11.85 TR
- b) 10.85TR
- c) 27.70 TR**
- d) 13.85 TR

436) A milk factory needs refrigeration plant for freshly processed milk @ 10 tons per hour from 65°C to 2°C. (Specific heat of milk = 3.89 kJ/kg-1.K-1). Theoretical power required for the compressor motor in the above question is .....if the COP of the plant is 3.

- a) 200 kW
- b) 126.91 kW
- c) 226.91 kW**
- d) 113.45 kW

437) A Carnot refrigeration cycle absorbs heat at 3° C and rejects it at 270 C. Calculate the coefficient of performance of this refrigeration cycle.

- a) 4
- b) 9
- c) 5**
- d) 6

- 438) A milk factory needs refrigeration plant for freshly processed milk @ 10 tons per hour from 65°C to 2°C. (Specific heat of milk = 3.89 kJ/kg-1.K-1). Theoretical refrigerator capacity required for the plant is .....
- 389 tonnes
  - 97.25 tonnes
  - 194.5 tonnes**
  - 67.25 tonnes
- 436) One tonne of Refrigeration (TR) is equal to ...
- All of these**
  - 3.5 kJ/s
  - 210 kJ/min
  - 12000 BTU/h
- 437) Which refrigeration cycle has the highest theoretical efficiency?
- Brayton Cycle
  - Reversed Carnot Cycle**
  - Reversed Joule Cycle
  - Bell Coleman Cycle
- 438) Latent heat is that part of heat in which ....remains constant
- Pressure
  - Entropy
  - Enthalpy
  - Temperature**
- 439) Coefficient of performance of a refrigerator is the ratio of ...
- Enthalpy to Entropy
  - Heat rejected to work supplied
  - Heat absorbed to work supplied**
  - Work done to heat supplied
- 440) Which relationship holds good for a heat pump and a refrigerator
- $(COP)_R + 2 = (COP)_P$
  - $(COP)_R + 1 = (COP)_P$**
  - $(COP)_R = (COP)_P$
  - $(COP)_R - 1 = (COP)_P$
- 441) In a refrigeration system, the lowest temperature of the cycle is achieved after .... process
- compressor
  - Condenser
  - Expansion Valve**
  - Evaporator
- 442) An ice plant produces 10 tonnes of ice per day at 0°C using water at room temp of 20°C. The theoretical power rating of the compressor motor will be .....if the COP of the plant is 2.5
- 29.38 kW
  - 39.38 kW

- c) **19.38 kW**
- d) 9.38 kW

443) On PV-Diagram, the area of a closed figure for a thermodynamic cycle represents ....

- a) Total internal energy
- b) **Work done**
- c) Heat energy absorbed or rejected
- d) Total entropy

444) A refrigerant has working temperature of -30oC and 40oC. What is the actual COP possible if the COP is 75% of the maximum?

- a) 3.6
- b) 4.6
- c) 5.6
- d) **2.6**

445) COP of a Bell Coleman's cycle becomes equal to that of a Carnot's cycle when .....during isentropic compression and isentropic expansion becomes equal.

- a) **Pressure ratio**
- b) Clearance volume
- c) Volume ratio
- d) Temperature ratio

446) The thermodynamics process in the condenser of a vapor compression refrigeration cycle is .....

- a) Isochoric
- b) Isothermal
- c) Reversible adiabatic
- d) **Isobaric**

447) The practical air refrigerator works on .....

- a) Stirling Cycle
- b) Otto Cycle
- c) Reversed Carnot Cycle
- d) **Bell Coleman Cycle**

448) For Winter Air Conditioning System, .....is used to add water to the ambient air.

- a) **Humidifier**
- b) Receiver
- c) Dehumidifier
- d) Air Filter

449) The process in the capillary tube in a vapor compression refrigeration system takes place at constant ..... Process

- a) Pressure
- b) **Enthalpy**
- c) Temperature
- d) Entropy

450) In a vapor compression refrigeration cycle, heat is absorbed by the refrigerant in ...

- a) Compressor
- b) Expansion valve
- c) Condenser
- d) Evaporator**

451) For perishable products, cooling load is calculated by multiplying mass of the products with....

- a) respiration**
- b) latent heat
- c) Freezing point
- d) sensible heat

452) In air-conditioning of aeroplanes, using air as refrigerant, the cycle used is.....

- a) Reversed Otto cycle
- b) Reversed Carnot cycle
- c) Reversed Brayton cycle**
- d) Reversed Rankine cycle

453) Reverse Carnot cycle is impossible to construct as ....cannot run simultaneously

- a) Reversible adiabatic and isobaric processes
- b) Isothermal and reversible adiabatic processes**
- c) isochoric and isentropic processes
- d) isobaric and isentropic processes

454) Air compression refrigeration cycles are not so often in used due to .....

- a) heavier in weight
- b) very low COP**
- c) air contamination
- d) leakage problems

455) A cinema hall of seating capacity of 3000 has been provided with an air conditioning plant with the following data:

Outdoor Conditions: 40°C DBT and 20°C WBT

Inside Conditions: 20°C DBT and 60% RH

Amount of air supplied: 0.3 m<sup>3</sup>/min/person

Find the capacity of humidifier.

- a) 137.36 kg/h**
- b) 68.68 kg/h
- c) Cannot be calculated from given data
- d) 34.34 kg/h

456) In psychrometric chart, total heat lines are ..... to wet bulb temperature lines?

- a) Vertical
- b) Equal
- c) None
- d) Parallel**

457) The minimum hot water inlet temperature for the operation of an adsorption chiller is.....

- a) 80°C
- b) 65°C
- c) **47°C**
- d) 35°C

458) .....is the ratio of the partial pressure of water ( $P_w$ ) to the partial pressure of saturated vapor pressure

- a) **Relative Humidity**
- b) Humidity Ratio
- c) Absolute Humidity
- d) Specific humidity

459) Which refrigerant is usually used in Vapour Compression Refrigeration System?

- a) NH<sub>3</sub>
- b) CO<sub>2</sub>
- c) SO<sub>2</sub>
- d) **All**

460) Keeping in view T-S diagram, if the refrigerant becomes superheated after compression, then the entropy is calculated by adding.....in the entropy at dry saturation condition.

- a)  **$C_p \ln (T_2/T_2')$**
- b)  $C_p (T_2' - T_2)$
- c)  $C_p (T_2 - T_2')$
- d)  $C_p \ln (T_2'/T_2)$

461) During cooling and dehumidification process, the heat removal rate is calculated by summing .....

- a) **(change in enthalpies) X (air mass flow rate) + (change in humidity ratio) x (air mass flowrate)**
- b) (change in enthalpies) X (air mass flow rate) X (Liquid enthalpy) + (change in humidity ratio) x (air mass flow rate)
- c) (change in enthalpies) X (air mass flow rate) + (change in humidity ratio) X (Liquid enthalpy)
- d) (change in enthalpies) X (air mass flow rate) + (change in humidity ratio) x (air mass flow rate) X (Liquid enthalpy)

462) Barometer is used to measure:

- a) **atmospheric pressure**
- b) pressure in pipes
- c) difference of pressure between two points in a pipe
- d) pressure in pipes

463) An ice plant produces 10 tonnes of ice per day at 0°C using water at room temperature of 20°C. The theoretical refrigerator capacity of the plant will be ..... tonnes of refrigeration (TR).

- a) 11.85
- b) 10.85
- c) **13.85**

- d) 12.85
- 464) In SI System, Enthalpy is measured in .....
- British Thermal Unit (BTU)
  - Joule or kJ**
  - Centigrade Heat Unit (CHU)
  - Watt or kW
- 465) Total enthalpy of moist air is the enthalpy of dry air and the product of .....
- Relative humidity and Relative humidity of water vap
  - Relative humidity and enthalpy of water vap**
  - Relative humidity and enthalpy of dry air
  - Humidity ratio and enthalpy of water vapors
- 466) The COP of double stage absorption chiller varies between.....
- 0.5-0.6
  - 1.4-1.5
  - 0.7-0.9
  - 1.1-1.2**
- 467) The space between the liquid and the vapour lines in p-h chart is known as .....
- All
  - Sub-cooled liquid region
  - Wet vapour region**
  - Superheated vapour region
- 468) The length and width of a square duct will be .....if the fan is supplying air @ 5000 cubic feet per minute at constant velocity of 1250 feet/minute
- 4 square feet
  - 22 inches
  - 70.71 inches
  - 24 inches**
- 469) If partial pressure of dry air and barometric pressure of mixture are 38 pascal and 100 pascals respectively. What will be the partial pressure of water vapors?
- 138 Pa
  - 52 Pa
  - 62 Pa**
  - 62 PA
- 470) Specific volume is the ratio of .....
- total volume of moist air to the mass of moist air
  - total volume of moist air to the mass of dry air**
  - total volume of dry air to the mass of moist air
  - total mass of moist air to the volume of dry air
- 471) In Vapor compression refrigeration, highest and lowest temperature occur after ..... and .....respectively.
- Condenser, evaporator
  - Compressor, expansion value**
  - Evaporator, condenser

- d) Compressor, Condenser
- 472) The sensible cooling can be done only up to the .....
- Dry Bulb Temperature
  - All
  - Dew Point Temperature**
  - Wet Bulb Temperature
- 473) From which medium is required in evaporator for absorbing latent heat by refrigerant?
- Air
  - Universal
  - All**
  - Salt Water
- 474) The Conditioned air from the circulating fan to the space to be air conditioned at proper point through.....?
- Supply Ducts**
  - Filters
  - Supply Outlets
  - Return Ducts
- 475) On psychrometric chart, the cooling process becomes parallel to .....at dew point temperature
- Temperature axis
  - enthalpy axis
  - Specific humidity axis
  - 100% Relative humidity line**
- 476) The vapor compression system and vapor absorption system use .....Energy &..... Energy to change the condition of refrigerant respectively
- Chemical, Heat
  - Heat, Mechanical
  - Mechanical, Heat**
  - Heat, Kinetic
- 477) Which of the following material is used as a solid sorbent in open cycle process?
- Activated Carbon
  - LiCl
  - LiBr
  - Silica gel**
- 478) At 20°C DBT and 20°C WBT, RH is found to be .....% at atmospheric pressure.
- 50
  - 88.20
  - 70
  - 100**
- 479) At 25°C DBT and 50% RH, the value of enthalpy will be .....kJ/kg at atmospheric pressure.
- 100



- b) 200
- c) 150
- d) **50**

480) Power factor is kept high

- a) to reduce line losses
- b) to maximize utilization
- c) to reduce voltage regulation of the line
- d) **All of the above**

481) An ice plant produces 10 tonnes of ice per day at 0°C using water at room temperature of 20°C. The theoretical power rating of the compressor motor will be .....kW if the COP of the plant is 2.5.

- a) 9.38
- b) **19.38**
- c) 39.38
- d) 29.38

482) Sensible heat factor is equal to .....

- a) (Sensible heat)/(Latent heat)
- b) **(Sensible heat)/(Latent heat + Sensible heat)**
- c) (Total heat)/Sensible heat
- d) (Sensible heat + Latent heat )/(Sensible heat)

483) An air conditioning plant is handling 100 cubic meter of air per minute at 32°C dry bulb temperature and 22°C wet bulb temperature. If the final condition of air are 22°C dry bulb temperature and 50% relative humidity. Find the capacity of humidifier?

- a) 8.7 kg/h
- b) 14.5 kg/h
- c) **29 kg/h**
- d) 29 kg/s

484) Which of the followings is used as a working pair for adsorption chiller?

- a) LiBr/H<sub>2</sub>O
- b) **H<sub>2</sub>O-Zeolite**
- c) LiBr/NH<sub>3</sub>
- d) NH<sub>3</sub>/H<sub>2</sub>O

485) .....is the temperature of air at which water vapor in air starts condensing when air cooled at constant humidity and constant atmospheric pressure

- a) **Dew Point Temperature**
- b) Dry Bulb Temperature
- c) Wet Bulb Temperature
- d) Wet Bulb Depression

486) The process generally used in winter air conditioning to warm and humidify the air, is called .....

- a) **Heating and Humidification**
- b) Cooling and Dehumidification
- c) Dehumidification

- d) Humidification
- 487) A desiccant evaporative cooling (DEC) system uses..... as refrigerant for producing conditioned air.
- LiBr
  - Ammonia
  - Water**
  - None of these
- 488) ..... is used in place of throttle valve for current domestic refrigerators
- Beaker
  - Small bore tube**
  - Expansion cylinder
  - Receiver
- 489) Power of cooling coil or heating coil is calculated by simply multiplying ..... & .....
- Volume flow rate, Change in enthalpy
  - mass flow rate, Change in enthalpy**
  - mass flow rate, Change in humidity ratio
  - mass flow rate, Change in specific humidity
- 490) The central air conditioning system is adopted when the air flow is more than and cooling capacity required is .....
- 300 m<sup>3</sup>/ min, 25 tonnes or more
  - Both**
  - 5 m<sup>3</sup>/s, 25 tonnes or more
  - None
- 491) Atmospheric air at a dry bulb temperature  $T_{db}=15^{\circ}\text{C}$  and relative humidity  $\Phi=80\%$  has been heated and humidified to  $41^{\circ}\text{C}$  and 41% relative humidity. Determine the amount of water added in kg per kg of dry air
- 47.75
  - 21.42
  - 42.42
  - 0.0117**
- 492) In adiabatic mixing process of two air streams ( 1 & 2) to form third state of air stream (3) on psychrometric chart is equal to .....
- Ratio of change in humidity ratio of stream 3 and stream 2 to the change in humidity ratio of stream 3 and stream 1.
  - Ratio of change in enthalpy of stream 3 and stream 2 to the change in enthalpy of stream 3 and stream 1.
  - Both of options 1 & option 2**
  - None of these
- 493) The ratio of mass of water vapour to the mass of dry air in a given volume of the air-vapour mixture is called?
- Humidity ratio**
  - Relative Humidity

- c) saturated Water vapors
- d) Specific Weight

494) A cinema hall of seating capacity of 3000 has been provided with an air conditioning plant with the following data:

Outdoor Conditions: 40°C DBT and 20°C WBT

Inside Conditions: 20°C DBT and 60% RH

Amount of air supplied: 0.3 m<sup>3</sup>/min/person

Find the capacity of cooling coil.

- a) 139.12
- b) 69.56 TR**
- c) 30.32 TR
- d) 34.78 TR

495) For sensible heating and cooling processes on psychrometry, mass balance at point 1 and point 2 are related as:

- a) Mass at point 1 = Mass at point 2**
- b) Mass at point 1 + mass of water added = Mass at point 2
- c) None of these
- d) Mass at point 1 = Mass at point 2 + mass of water added

496) The conditioned air supplied to the room must have the capacity to take up .....

- a) Room latent heat load only
- b) Room sensible heat load only
- c) None of these
- d) Both room sensible heat and latent heat loads**

497) In the cycle with sub-cooling or under-cooling during condensation process, the temperature of the refrigerant .....

- a) temperature and pressure of the refrigerant remain constant
- b) temperature of the refrigerant increases
- c) phase of the refrigerant changes from gas to liquid
- d) temperature of the refrigerant decreases**

498) The amount of useful cooling energy produced per unit thermal heat expense is called.....

- a) COP<sub>el</sub>
- b) COP<sub>th</sub>**
- c) COP<sub>sol</sub>
- d) None of these

499) The temperature of air recorded by a thermometer, unaffected by radiation and the moisture present in it, is called .....

- a) Wet Bulb Temperature
- b) Dew Point Temperature
- c) Dry Bulb Temperature**

d) None

500) The refrigerant (R-12) is superheated by  $6^{\circ}\text{C}$  before entering the compressor if the liquid heat is  $0.733 \text{ kJ/kg K}$ ; then the degree of superheat will be ....kJ/kg.

- a) **4.40**
- b) 188.4
- c) 184
- d) 8.80

501. The absorption or release of thermal energy changes the

- a) external energy of matter
- b) internal energy of matter**
- c) both internal and external energy of matter
- d) none of the energies

502. The amount of thermal energy required to raise temperature of 1 kg of substance by 1 K ( $1^{\circ}\text{C}$ ) is termed as

- a) Heat capacity
- b) Specific Heat Capacity**
- c) Latent Heat
- d) Specific Latent Heat
- e)

503. Unit of thermal conductivity in S.I. units is

- a)  $\text{J/m}^2 \text{ s}$
- b)  $\text{J/m}^{\circ}\text{K s}$
- c)  $\text{Jm}^{\circ}\text{K}$**
- d) (a) and (c) above

504. Thermal conductivity of solid metals with rise in temperature normally

- a) increases
- b) decreases**
- c) remains constant
- d) may increase or decrease depending on temperature

505. Suppose that a hot metal ball is immersed in cold water, then temperature distribution in the body depends upon

- a) thermal conductivity of the body
- b) convective heat transfer from the body surface to water
- c) both a. and b.**
- d) none of the above

506. Thermal conductivity of non-metallic amorphous solids with decrease in temperature

- a) increases
- b) decreases**
- c) remains constant
- d) may increase or decrease depending on temperature

507. Heat transfer takes place as per –

- a) zeroth law of thermodynamics

- b) first law of thermodynamic
  - c) second law of the thermodynamics**
  - d) Kirchoff's law (e) Stefan's law.
508. 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
509. What is lumped heat capacity analysis?
- a) the analysis of a system in which it is assumed to be at nonuniform temperature
  - b) the analysis of a system in which it is assumed to be at uniform temperature**
  - c) the analysis of a system in which it is assumed to be at either uniform or nonuniform temperature
  - d) none of the above
510. When heat is transferred from hot body to cold body, in a straight line, without affecting the intervening medium, it is referred as heat transfer by
- a) conduction
  - b) convection
  - c) radiation**
  - d) conduction and convection
511. Sensible heat is the heat required to
- a) change vapour into liquid
  - b) change liquid into vapour
  - c) increase the temperature of a liquid of vapour**
  - d) convert water into steam and superheat it
512. The Biot number or Biot modulus is given by
- a) the ratio of external convection resistance to the internal conduction resistance
  - b) the ratio of internal conduction resistance to the external convection resistance**
  - c) multiplying internal conduction resistance and external convection resistance
  - d) none of the above
513. The insulation ability of an insulator with the presence of moisture would
- a) increase
  - b) decrease**
  - c) remain unaffected
  - d) may increase/decrease depending on temperature and thickness of insulation
514. In convection heat transfer energy transfer takes place between
- a) two solid surfaces connected physically
  - b) solid surface and fluid system in motion**
  - c) both a. and b.
  - d) none of the above

515. When heat is transferred by molecular collision, it is referred to as heat transfer by
- a) conduction
  - b) convection**
  - c) radiation
  - d) scattering
516. Heat transfer in liquid and gases takes place by
- a) conduction
  - b) convection**
  - c) radiation
  - d) conduction and convection
517. Which of the following is the case of heat transfer by radiation
- a) blast furnace
  - b) heating of building
  - c) cooling of parts in furnace
  - d) heat received by a person from fireplace**
518. Internal energy is a function of
- a) Enthalpy
  - b) energy
  - c) temperature**
  - d) entropy
519. Pick up the wrong case. Heat flowing from one side to other is directly proportional to
- a) surface area
  - b) time
  - c) thickness**
  - d) temperature difference
520. Metals are good conductors of heat because
- a) their atoms collide frequently**
  - b) their atoms are relatively far apart
  - c) they contain free electrons
  - d) they have high density
521. 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 the above.**
522. Total heat is the heat required to
- a) change vapour into liquid
  - b) change liquid into vapour
  - c) increase the temperature of a liquid or vapour
  - d) convert water into steam and superheat it**
523. Cork is a good insulator because it has
- a) free electrons

- b) atoms colliding frequency
- c) low density
- d) porous body**

524. What is the correct formula for the rate of heat transfer ( $q$ ) from a surface of body of the area  $A$  to the surrounding fluid, when surface of the body is at temperature  $T_s$  and the surrounding fluid is at temperature  $T_\infty$ ?

- a)  $q = k A (T_s - T_\infty)$
- b)  $q = h A (T_s - T_\infty)$**
- c)  $q = (h/k) A (T_s - T_\infty)$
- d)  $q = (1/h) A (T_s - T_\infty)$

525. When the surface of a body is at higher temperature than the surrounding fluid, then the heat flows firstly from surface of the body to the adjacent layer of fluid by

- a) convection
- b) conduction**
- c) radiation
- d) none of the above

526. Thermal conductivity of water in general with rise in temperature

- a) increases
- b) decreases
- c) remains constant
- d) may increase or decrease depending on temperature**

527. Thermal conductivity of water at  $20^\circ\text{C}$  is of the order of

- a) 0.1
- b) 0.23
- c) 0.42
- d) 0.51**

528. Which of the following fluid can be considered as an ideal fluid?

- a) viscous fluid
- b) non-viscous fluid**
- c) compressible fluid
- d) all of the above

529. Temperature of steam at around  $540^\circ\text{C}$  can be measured by

- a) thermometer
- b) radiative pyrometer
- c) thermistor
- d) thermocouple**

530. Thermal conductivity of air at room temperature in  $\text{kcal/m h }^\circ\text{C}$  is of the order of

- a) 0.002
- b) 0.02**
- c) 0.01
- d) 0.1

531. 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
532. Thermal conductivity of air with rise in temperature
- a) increases**
  - b) decreases
  - c) remains constant
  - d) may increase or decrease depending on temperature
533. Heat flows from one body to other when they have
- a) different heat contents
  - b) different specific heat
  - c) different atomic structure
  - d) different temperatures**
534. The concept of overall coefficient of heat transfer is used in heat transfer problems of
- a) conduction
  - b) convection
  - c) radiation
  - d) conduction and convection.**
535. In heat transfer, conductance equals conductivity (kcal/hr/sqm/°C) divided by
- a) hr (time)
  - b) sqm (area)
  - c) °C (temperature)
  - d) cm (thickness)**
536. What is the correct formula for The Biot number?
- a)  $hl/k$**
  - b)  $k/hl$
  - c)  $l/hk$
  - d)  $hk/l$
537. The amount of heat flow through a body by conduction is
- a) directly proportional to the surface area of the body
  - b) directly proportional to the temperature difference on the two faces of the body
  - c) inversely proportional to the thickness of the body
  - d) all of the above.**
538. Which of the following has least value of conductivity
- a) glass
  - b) plastic
  - c) rubber
  - d) air.**



539. Which of the following is expected to have highest thermal conductivity
- steam
  - solid ice**
  - melting ice
  - water
540. Thermal conductivity of glass-wool varies from sample to sample because of variation in
- composition
  - density
  - porosity
  - all of the above.**
541. Thermal conductivity of a material may be defined as the
- quantity of heat flowing in one second through one cm cube of material when opposite faces are maintained at a temperature difference of  $1^{\circ}\text{C}$
  - quantity of heat flowing in one second through a slab of the material of area one cm square, thickness 1 cm when its faces differ in temperature by  $1^{\circ}\text{C}$
  - heat conducted in unit time across unit area through unit thickness when a temperature difference of unity is maintained between opposite faces
  - all of the above**
542. Which of the following has maximum value of thermal conductivity
- steel
  - brass
  - copper**
  - lead.
543. What is the SI unit for absolute or dynamic viscosity ( $\mu$ )?
- $\text{Ns/m}^2$**
  - $\text{Nm}^2/\text{s}$
  - $\text{N/m}^2\text{s}$
  - $\text{N/m}^2$
544. The viscosity of a liquid
- increases with increase in liquid temperature
  - decreases with increase in liquid temperature**
  - is not affected by the change in liquid temperature
  - is unpredictable
545. Moisture would find its way into insulation by vapour pressure unless it is prevented by
- high thickness of insulation
  - high vapour pressure
  - less thermal conductivity insulator
  - a vapour seal**
546. Heat is transferred by all three modes of transfer, viz, conduction, convection and radiation in
- electric heater

- b) steam condenser
- c) melting of ice
- d) boiler.**

547. The ratio of heat flow  $Q_1/Q_2$  from two walls of same thickness having their thermal conductivities as  $K_1 = 2K_2$  will be

- a) 1
- b) 0.5
- c) 2**
- d) 0.25

548. Heat transfer by radiation mainly depends upon

- a) its temperature
- b) nature of the body
- c) kind and extent of its surface
- d) all of the above**

549. Thermal diffusivity is

- a) a dimensionless parameter
- b) function of temperature
- c) used as mathematical model
- d) a physical property of the material**

550. Thermal diffusivity of a substance is .

- a) proportional of thermal conductivity**
- b) inversely proportional to  $k$
- c) proportional to  $(k)$
- d) inversely proportional to  $k^2$

551. Unit of thermal diffusivity is

- a)  $m^2/hr$**
- b)  $m^2/hr^\circ C$
- c)  $kcal/m^2 hr$
- d)  $kcal/m.hr^\circ C$

552. What is kinematics viscosity of a fluid?

- a) dynamic viscosity per unit volume of the fluid
- b) dynamic viscosity per unit weight of the fluid
- c) dynamic viscosity per unit density of the fluid**
- d) none of the above

553. Thermal conductivity of wood depends on

- a) moisture
- b) density
- c) temperature
- d) all of the above**

554. In convection heat transfer from hot flue gases to water tube, even though flow may be turbulent, a laminar flow region (boundary layer of film) exists close to the tube. The heat transfer through this film takes place by

- a) convection
  - b) radiation
  - c) conduction**
  - d) both convection and conduction.
555. Heat conducted through unit area and unit thick face per unit time when temperature difference between opposite faces is unity, is called
- a) thermal resistance
  - b) thermal coefficient
  - c) temperature gradient
  - d) thermal conductivity**
556. The heat transfer is largely governed by conduction from the surface of the fluid, when
- a) the velocity of the fluid is high
  - b) the velocity of the fluid is small**
  - c) the velocity of the fluid is small as well as high
  - d) none of the above
557. In turbulent flow of the fluid,
- a) conduction becomes more important
  - b) conduction becomes less important**
  - c) doesn't matter
  - d) none of the above
558. The rate of energy emission from unit surface area through unit solid angle normal to the surface, is known as
- a) emissivity
  - b) transmissivity
  - c) reflectivity
  - d) intensity of radiation**
559. Emissivity of a white polished body in comparison to a black body is
- a) higher
  - b) lower**
  - c) same
  - d) depends upon the shape of body
  - e) none of the above.
560. A grey body is one whose absorptivity
- a) varies with temperature
  - b) varies with wavelength of the incident ray
  - c) is equal to its emissivity**
  - d) does not vary with temperature and. wavelength of the incident ray
561. Two balls of same material and have their diameters in the ratio of 2 : 1 and both are heated to same temperature and allowed to cool by radiation. Rate of cooling by big ball as compared to smaller one will be in the ratio of
- a) 1 :1

- b) 2: 1
- c) 1 : 2**
- d) 4 : 1

562. Mixing of fluid from regions of high temperature with the fluid from region of low temperature

- a) increases the rate of heat transfer**
- b) decreases the rate of heat transfer
- c) rate of heat transfer is not affected
- d) none of the above

563. A non-dimensional number generally associated with natural convection heat transfer is

- a) Grashoff number**
- b) Nusselt number
- c) Weber number
- d) Prandtl number

564. LMTD in case of counter flow heat exchanger as compared to parallel flow heat exchanger is

- a) higher**
- b) lower
- c) same
- d) depends on the area of heat exchanger

565. In heat exchangers, degree of approach is defined as the difference between temperatures of

- a) cold water inlet and outlet
- b) hot medium inlet and outlet
- c) hot medium outlet and cold water inlet
- d) hot medium outlet and cold water outlet**

566. In counter flow heat exchangers

- a) both the fluids at inlet (of heat exchanger where hot fluid enters) are in their coldest state
- b) both the fluids at inlet are in their hot test state**
- c) both the fluids at exit are in their hottest state
- d) one fluid is in hottest state and other in coldest state at inlet

567. A steam pipe is to be insulated by two insulating materials put over each other. For best results

- a) better insulation should be put over pipe and inferior one over it**
- b) inferior insulation should be put over pipe and better one over it
- c) both may be put in any order
- d) whether to put inferior OIL over pipe or the better one would depend on steam temperature

568. Fourier's law of heat conduction is valid for

- a) one dimensional cases only**
- b) two dimensional cases only

- c) three dimensional cases only
  - d) regular surfaces having non-uniform temperature gradients
569. According of Kirchhoff's law,
- a) radiant heat is proportional to fourth power of absolute temperature
  - b) emissive power depends on temperature
  - c) emissive power and absorptivity are constant for all bodies
  - d) ratio of emissive power to absorptive power for all bodies is same and is equal to the emissive power of a perfectly black body.**
570. All radiations in a black body are
- a) reflected
  - b) refracted
  - c) transmitted
  - d) absorbed**
571. According to Kirchoff's law, the ratio of emissive power to absorptivity for all bodies is equal to the emissive power of a
- a) grey body
  - b) brilliant white polished body
  - c) red hot body
  - d) black body**
572. The concept of overall coefficient of heat transfer is used in case of heat transfer by
- a) conduction
  - b) convection
  - c) radiation
  - d) conduction and convection**
573. The unit of overall coefficient of heat transfer is
- a) kcal/m<sup>2</sup>
  - b) kcal/hr °C
  - c) kcal/m<sup>2</sup> hr °C**
  - 4) kcal/m hr °C
574. Joule sec is the unit of
- a) universal gas constant
  - b) kinematic viscosity
  - c) thermal conductivity
  - d) Planck's constant**
575. The value of Prandtl number for air is about
- a) 0.1
  - b) 0.3
  - c) 0.7**
  - d) 1.7
576. The value of the wavelength for maximum emissive power is given by —
- a) Wien's law**
  - b) Planck's law

- c) Stefan's law
  - d) Fourier's law
577. Log mean temperature difference (LMTD) in case of counter flow compared to parallel flow will be
- a) same
  - b) more**
  - c) less
  - d) depends on other factors
578. The energy distribution of an ideal reflector at higher temperatures is largely in the range of
- a) shorter wavelength**
  - b) longer wavelength
  - c) remains same at all wavelengths
  - d) wavelength has nothing to do with it
579. Total emissivity of polished silver compared to black body is
- a) same
  - b) higher
  - c) more or less same
  - d) very much lower**
580. When the thickness of insulation is less than the critical thickness of the insulation, then the heat transfer rate of insulated pipe
- a) will be more than the heat transfer rate from the same pipe without insulation**
  - b) will be less than the heat transfer rate from the same pipe without insulation
  - c) will become equal to the heat transfer rate from the same pipe without insulation
  - d) none of the above
581. Aluminum is used as a fin material because
- a) it has higher convection heat transfer coefficient
  - b) it has higher thermal conductivity**
  - c) it has lower convection heat transfer coefficient
  - d) it has lower thermal conductivity
582. According to Stefan-Boltzmann law, ideal radiators emit radiant energy at a rate proportional to
- a) absolute temperature
  - b) square of temperature
  - c) fourth power of absolute temperature**
  - d) fourth power of temperature
583. Which of the following property of air does not increase with rise in temperature
- a) thermal conductivity
  - b) thermal diffusivity
  - c) density**
  - d) dynamic viscosity

584. The unit of Stefan Boltzmann constant is
- $W/cm^2 \text{ } ^\circ K$
  - $W/cm^4 \text{ } ^\circ K$
  - $W^2/cm \text{ } ^\circ K^4$
  - $W/cm^2 \text{ } ^\circ K^4$**
585. Which of the following is/are example/s of heat exchanger?
- Feed water heater in which a stream of steam is directly mixed with cold water and the mixture leaves at uniform temperature
  - Feed water heater in which a stream of steam and cold water are not mixed and separated by partition through which heat flows
  - both a. and b.**
  - none of the above
586. In free convection heat transfer, Nusselt number is function of
- Grashoff no. and Reynold no.
  - Grashoff no. and Prandtl no.**
  - Prandtl no. and Reynold no.
  - Grashoff no., Prandtl no. and Reynold no.
587. Stefan Boltzmann law is applicable for heat transfer by
- conduction
  - convection
  - radiation**
  - conduction and radiation combined
588. The thermal diffusivities for gases are generally
- more than those for liquids**
  - less than those for liquids
  - more than those for solids
  - dependent on the viscosity
589. The thermal diffusivities for solids are generally
- less than those for gases
  - less than those for liquids
  - more than those for liquids and gases**
  - more or less same as for liquids and gases
590. Thermal diffusivity of a substance is
- directly proportional to thermal conductivity
  - inversely proportional to density of substance
  - inversely proportional to specific heat
  - all of the above**
591. Which of the following temperature difference is safer than other to consider in designing of heat exchangers?
- Arithmetic Mean Temperature Difference ( $\Delta T_{am}$ )**
  - Logarithmic Mean Temperature Difference (LMTD)
  - Both have nothing to do with safety
  - None of these

592. When is the arithmetic mean temperature difference of heat exchanger used instead of LMTD?
- when the temperature profiles of two fluids of heat exchanger are sloping downward with curve
  - when the temperature profiles of two fluids of heat exchanger are sloping upward with curve
  - when the temperature profiles of two fluids of heat exchanger are straight**
  - none of the above
593. The ratio of the emissive power and absorptive power of all bodies is the same and is equal to the emissive power of a perfectly black body. This statement is known as
- Krichoff's law**
  - Stefan's law
  - Wien' law
  - Planck's law
594. According to Stefan's law, the total radiation from a black body per second per unit area is proportional to
- absolute temperature
  - $T^2$
  - $T^5$
  - $t$**
595. According to Wien's law, the wavelength corresponding to maximum energy is proportion to
- absolute temperature (T)**
  - Irradiance
  - wave length
  - time
596. Depending on the radiating properties, a body will be white when
- $p = 0, x = 0$  and  $a = 1$
  - $p=1, T = 0$  and  $a = 0$**
  - $p = 0, x = 1$  and  $a = 0$
  - $x = 0, a + p = 1$
- where  $a$  = absorptivity,  $p$  = reflectivity,  $x$  = transmissivity
597. What is the correct formula for the Nusselt modulus or Nusselt number (Nu)?
- $Nu = h k l$
  - $Nu = (h k) / l$
  - $Nu = (k l) / h$
  - $Nu = (h l) / k$**
598. Depending on the radiating properties, a body will be black when
- $p = 0, x = 0$  and  $a = 1$**
  - $p= 1, T = 0$  and  $a = 0$
  - $p = 0, x = 1$  and  $a = 0$
  - $x = 0, a + p = 0$**



where  $a$  = absorptivity,  $p$  = reflectivity,  $X$  = transmissivity.

599. The total emissivity power is defined as the total amount of radiation emitted by a black body per unit
- a) temperature
  - b) thickness
  - c) area
  - d) time**
600. In parallel flow heat exchangers
- a) the exit temperature of hot fluid is always equal to the exit temperature of cold fluid
  - b) the exit temperature of hot fluid is always less than the exit temperature of cold fluid
  - c) the exit temperature of hot fluid is always more than the exit temperature of cold fluid**
  - d) we cannot predict comparison between exit temperatures of hot fluid and cold fluid
601. The ratio of the energy absorbed by the body to total energy falling on it is called
- a) absorptive power**
  - b) emissive power
  - c) absorptivity
  - d) emissivity
602. For the same inlet and exit temperatures of two fluids, the LMTD for counterflow is always
- a) smaller than LMTD for parallel flow
  - b) greater than LMTD for parallel flow**
  - c) same as LMTD for parallel flow
  - d) unpredictable
603. 40% of incident radiant energy on the surface of a thermally transparent body is reflected back. If the transmissivity of the body be 0.15, then the emissivity of surface is
- a) 0.45**
  - b) 0.55
  - c) 0.40
  - d) 0.75
604. The amount of radiation mainly depends on
- a) nature of body
  - b) temperature of body
  - c) type of surface of body
  - d) all of the above**
605. The emissive power of a body depends upon its
- a) temperature
  - b) wave length
  - c) physical nature

**d) all of the above**

606. Two plates spaced 150 mm apart are maintained at 1000°C and 70°C. The heat transfer will take place mainly by
- a) convection
  - b) free convection
  - c) forced convection
  - d) radiation**
  - e) radiation and convection.
607. Absorptivity of a body will be equal to its emissivity
- a) at all temperatures
  - b) at one particular temperature
  - c) when system is under thermal equilibrium**
  - d) at critical temperature
608. In regenerator type heat exchanger, heat transfer takes place by
- a) direct mixing of hot and cold fluids
  - b) a complete separation between hot and cold fluids
  - c) flow of hot and cold fluids alternately over a surface**
  - d) generation of heat again and again
609. A perfect black body is one which
- a) is black in colour
  - b) reflects all heat
  - c) transmits all heat radiations
  - d) absorbs heat radiations of all wave lengths falling on it**
610. Planck's law holds good for
- a) black bodies
  - b) polished bodies
  - c) all coloured bodies
  - d) all of the above
611. The Nusselt modulus or Nusselt number is a convenient measure of
- a) rate of heat transfer
  - b) convective heat transfer coefficient**
  - c) both a. and b.
  - d) none of the above
612. If the temperature of a solid surface changes from 27°C to 627°C, then its emissive power changes in the ratio of
- a) 3
  - b) 6
  - c) 9
  - d) 81.**
613. A grey body is one whose absorptivity
- a) varies with temperature
  - b) varies with the wave length of incident ray

- c) varies with both  
d) does not vary with temperature and wave length of the incident ray
614. Entropy is a  
a) path function, intensive property  
b) path function, extensive property  
c) point function, intensive property  
**d) point function, extensive property**
615. Amount of heat energy produced on \_\_\_\_\_ combustion of 1kg of fuel is Calorific value  
a) Incomplete  
**b) Complete**  
c) Half  
d) Standard
616. Innermost zone of the flame is the  
a) Hottest part  
b) Moderately hot part  
**c) Least hot part**  
d) Cold part
617. When the fuel is burned and water is released in the liquid phase, the heating value of fuel is called  
**a) Higher heating value**  
b) Lower heating value  
c) Enthalpy of formation  
d) Latent heat of fusion
618. The volumetric based energy density is expressed as  
**a) Wh/L**  
b) MJ/kg  
c) h/m<sup>3</sup>  
d) kJ/m<sup>3</sup>/h
619. Density compare to water is expressed as,  
a) Density of substance  
b) Specific density  
**c) Specific gravity**  
d) Specific heat
620. Nitrogen produces NO<sub>x</sub> gases when burns under  
a) NO<sub>x</sub> reaction  
b) Exothermic reaction  
**c) Endothermic reaction**  
d) Endothermic or exothermic reactions
621. Slow, flameless form of combustion is called  
a) Drop combustion  
b) Flameless combustion

- c) Glowing  
**d) Smoldering**
622. A heat exchanger having separate flow paths for exchanging heat across is called  
 a) **Recuperative**  
 b) Regenerative  
 c) Parallel heat exchanger  
 d) Cross flow heat exchanger
623. Liquefied petroleum gas is a ----- and is stored at ----- pressure  
 a) **Gas, low**  
 b) Liquid, high  
 c) Fluid, high  
 d) Fuel, low
624. On complete combustion process one kg of methane gas will produce -----kg water  
 a) 2.75  
 b) 2.0  
 c) **2.25**  
 d) 2.50
625. If methane combustion process releases 50.1 kJ/g energy then it would equivalent of.....  
 a) **802.3 kJ/mol CH<sub>4</sub>**  
 b) 812 kJ/mol CH<sub>4</sub>  
 c) 812 J/mol CH<sub>4</sub>  
 d) 802.3 kcal/mol CH<sub>4</sub>
626. The NCV of methane combustion is 75 kJ/kg, when enthalpy of product of combustion is 3400 kJ then energy contents of reactant (CH<sub>4</sub>) is-----  
 a) 207 kJ/kg  
 b) 140.12 kJ/kg  
 c) **137.5 kJ/kg**  
 d) 237.5 MJ/kg
627. In a reaction, ethanol (C<sub>2</sub>H<sub>5</sub>OH) and CO<sub>2</sub> are produced from Glucose (C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>). The molecular weight of glucose is 180 grams/mol and the molar mass of ethanol is 46 g/mol, how many grams of carbon dioxide are produced when 1 mol of glucose is used?  
 a) 100 gm  
 b) 10 gm  
 c) **80 gm**  
 d) 40 gm
628. For a combustion process, the net energy change for the reaction is  
 a) **Bond Breaking Energies + Bond Forming Energies**  
 b) Bond Breaking Energies - Bond Forming Energies  
 c) Bond Breaking Energies \* Bond Forming Energies  
 d) Bond Breaking Energies/Bond Forming Energies

629. Fuel cetane number represents fuel .....
- Delay period
  - Ignition quality**
  - Volatility
  - Viscosity
630. For auto engines, the best fuel is
- Naphthenes
  - Olefins
  - Aromatics**
  - Paraffins
631. The most volatile fuel is
- Gasoline**
  - Fuel oil
  - Kerosene
  - Diesel
632. The combustion of ethane is given by equation  $2C_2H_6 + 7O_2 \rightarrow 4CO_2 + 6H_2O$  it means that
- The rate of consumption of ethane is seven times faster than the rate of consumption of oxygen.
  - The rate of formation of  $CO_2$  equals the rate of formation of water.
  - $CO_2$  is formed twice as fast as ethane is consumed**
  - Water is formed at a rate equal to two-third the rate of formation of  $CO_2$
633. The product of a combustion process contains volumes of 1.5  $CO_2$ , 8.10  $N_2$  and 4  $H_2O$ . The volume fraction of  $N_2$  on dry basis will be
- 59.55%
  - 1.67%
  - 84.37%**
  - 1.18%
634. The combustion efficiency increases with -----excess air rate
- Increased**
  - Decreased
  - Up to 10 % increase of
  - Stoichiometric
635. The ratio of air to fuel that burns all fuel with no excess air -----
- Zero % ratio
  - Compression ratio
  - Equivalent ratio
  - Stoichiometric**
636. For complete combustion of 2.8 kilograms of ethylene, the amount of oxygen needed is
- 2.8 kg
  - 96 kg**

- c) 6.4 kg  
d) 9.6 kg
637. The viscosities of gases -----with temperature  
a) Decrease  
b) Remain constant  
c) **Increase**  
d) Become negligible
638. The combustion efficiency is  
a) **Heat output rate by the rate of fuel input.**  
b) Heat output rate by the rate of fuel burnt.  
c) Stake temperature by fuel combustion temperature.  
d) Actual air-fuel ratio to Stoichiometric air-fuel ratio
639. A 5 g sample of methanol, CH<sub>3</sub>OH, was combusted in the presence of excess oxygen in a bomb calorimeter containing 4000 g of water. The temperature of the water increased from 24 °C to 29.76 °C. The heat capacity of the calorimeter was 2657 J/°C. The specific heat of water is 4.184 J/g°C. Calculate E for the reaction in kJ/mol  
a) -313 kJ/mol  
b) -789 kJ/mol  
c) **-716 kJ/mol**  
d) -121 kJ/mol
640. The higher and lower heating alues for a coal sample with composition by mass C = 70 %, O = 8 %, H = 10 %, N = 3 %, S = 2%, Ash = 7 % would  
a) **Higher 8805.80kcal/kg lower 8277.80 kcal/kg**  
b) Higher 7807.10kcal/kg lower 7223.50 kcal/kg  
c) Higher 9006.20kcal/kg lower 8217.10 kcal/kg  
d) Higher 8605.60kcal/kg lower 8075.70 kcal/kg
641. The ultimate analysis of coal determines its \_\_\_\_\_ content  
a) **Carbon, hydrogen, sulphur, nitrogen**  
b) Carbon, ash, sulphur, nitrogen  
c) Carbon, hydrogen, volatile matter, ash, nitrogen  
d) Carbon, sulphur, nitrogen
642. The reaction rate of  $2\text{N}_2\text{O}_5(\text{g}) \rightarrow 4\text{NO}_2(\text{g}) + \text{O}_2(\text{g})$   
a)  $-\frac{1}{2} \Delta [\text{N}_2\text{O}_5]/\Delta t = \frac{1}{4} \Delta [\text{NO}_2]/\Delta t = \Delta [\text{O}_2]/\Delta t$   
b)  $\frac{1}{2} \Delta [\text{N}_2\text{O}_5]/\Delta t = \frac{1}{4} \Delta [\text{NO}_2]/\Delta t = \Delta [\text{O}_2]/\Delta t$   
c)  $-\frac{1}{2} \Delta [\text{N}_2\text{O}_5]/\Delta t = -\frac{1}{4} \Delta [\text{NO}_2]/\Delta t = -\Delta [\text{O}_2]/\Delta t$   
d)  $-\frac{1}{2} \Delta [\text{N}_2\text{O}_5]/\Delta t = \frac{1}{4} \Delta [\text{NO}_2]/\Delta t + \Delta [\text{O}_2]/\Delta t$
643. The NCV of methane combustion is 75 kJ/kg, when enthalpy of product of combustion is 3400 kJ then energy contents of reactant (CH<sub>4</sub>) is-----  
a) 207 kJ/kg  
b) 140.12 kJ/kg  
c) **137.5 kJ/kg**  
d) 237.5 MJ/kg

644. Fuel cetane number represents fuel .....
- Delay period
  - Ignition quality**
  - Volatility
  - Viscosity
645. For auto engines, the best fuel is
- Naphthenes
  - Olefinsof
  - Aromatics**
  - Paraffins
646. Pick out the wrong statement.
- LPG is also used as fuel for automobiles & small furnaces and for cutting & welding of metals
  - The minimum temperature, at which a petroleum oil vapor catches fire and continues to burn, is called its flash point**
  - Each ton of petroleum oil on distillation produces about 30-50 Nm<sup>3</sup> of gas.
  - Maximum yield of naphthalene is obtained on distillation of crude oil.romatics  
Paraffins
647. Combustion reaction of fuels is a \_\_\_\_\_ reaction
- LPG auto catalytic
  - Exothermic**
  - Endothermic
  - Spontaneous
648. Which of the followings is closed cycle process for cooling applications?
- Adsorption**
  - Dehumidifier rotor
  - Counter flow absorber
  - None of these
649. The minimum hot water inlet temperature for the operation of an adsorption chiller is.....
- 35°C
  - 47°C**
  - 65°C
  - 80°C
650. A desiccant evaporative cooling (DEC) system uses..... as refrigerant for producing conditioned air.
- LiBr
  - Ammonia
  - Water**
  - None of these
651. Which of the followings is used as a working pair for adsorption chiller?
- LiBr/H<sub>2</sub>O
  - NH<sub>3</sub>/H<sub>2</sub>O

- c) **H<sub>2</sub>O-Zeolite**
- d) None of these

652. Which of the followings refer to COP of the absorption chiller?

- a)  $Q_g/Q_c$
- b)  $Q_c/W_e$
- c)  **$Q_c/Q_g$**
- d) None of these

653. The COP of double stage absorption chiller varies between.....

- a) 0.5-0.6
- b) 0.7-0.9
- c) **1.1-1.2**
- d) 1.4-1.5

654. Which of the following material is used as a solid sorbent in open cycle process?

- a) LiCl
- b) **Silica gel**
- c) LiBr
- d) Activated Carbon

655. Sling psychrometric consists of .....

- a) Dew point thermometer & hygrometer
- b) **Dry bulb thermometer & wet bulb thermometer**
- c) Both a & b
- d) None

656. The vapor compression system and vapor absorption system uses

.....&..... Energy to change the condition of refrigerant respectively

- a) Chemical, Heat
- b) **Mechanical, Heat**
- c) Heat, Kinetic
- d) Heat, Mechanical

657. Tonne of refrigeration is equal to.....

- a) 21 kJ/min
- b) 210 kJ/min
- c) 3.5 kW
- d) **Both b & c**

658. Air refrigerator works on .....

- a) Carnot Cycle
- b) Rankine Cycle
- c) Reversed Carnot Cycle
- d) **Bell –Coleman Cycle**

659. The curved lines on a psychrometric chart indicates

- a) Specific humidity
- b) **Relative humidity**
- c) Specific volume



- d) Enthalpy
660. During Sensible cooling of air, the specific humidity
- Increases
  - decreases
  - remains constant**
  - Cannot be determined by this relation
661. A refrigerant has working temperature of  $-30^{\circ}\text{C}$  and  $40^{\circ}\text{C}$ . What is the actual COP possible if the COP is 75% of the maximum?
- 2.6**
  - 3.6
  - 4.6
  - 5.6
662. In the above question, the actual refrigerating effect produced per kWh will be.....
- 0.44
  - 0.54
  - 0.74**
  - 0.84
663. In a vapor compression system, the condition of the refrigerant before entering the compressor is.....
- Superheated vapor
  - Wet vapor
  - dry saturated liquid
  - Any one of these**
664. Heating and cooling processes on psychrometric chart are represented by straight lines parallel to .....axis
- RH
  - Enthalpy
  - DBT**
  - Specific Humidity
665. In Vapor compression refrigeration, highest and lowest temperature occur after ..... and .....respectively.
- Compressor, Condenser
  - Condenser, evaporator
  - Evaporator, condenser
  - Compressor, expansion value**
666. The process in the capillary tube in a vapor compression refrigeration system follows a/an..... Process.
- Isobaric
  - Isothermal
  - Reversible Adiabatic
  - Irreversible adiabatic**

667. Which relationship holds good for a heat pump and refrigerator (where symbols carry usual meanings)
- $(COP)_R = (COP)_P$
  - $(COP)_R + 1 = (COP)_P$**
  - $(COP)_R - 1 = (COP)_P$
  - $(COP)_R + 2 = (COP)_P$
668. On TS-Diagram, the area of a closed figure for a thermodynamic cycle represents ....
- Work done
  - Heat energy absorbed or rejected**
  - Total internal energy
  - Total entropy
669. The amount of useful cooling energy produced per unit thermal heat expense is called.....
- $COP_{el}$
  - $COP_{th}$**
  - $COP_{sol}$
  - None of these
670. Which of the followings is used as working pair in absorption chiller?
- Silicagel/ $H_2O$
  - $NH_3/H_2O$**
  - $H_2O$ -Zeolite
  - None of these
671. Which of the followings refer to thermal COP of an adsorption chiller?
- $Q_g/Q_c$
  - $Q_c/W_e$
  - $Q_c/Q_g$**
  - None of these
672. The COP of single stage absorption chiller varies between.....
- 0.5-0.6
  - 0.6-0.8**
  - 1.1-1.2
  - 1.4-1.5
673. Which of the following material is used as a solid sorbent in open cycle process?
- LiCl
  - Silica gel**
  - LiBr
  - Activated Carbon
674. The practical air refrigerator works on .....
- Carnot Cycle
  - Rankine Cycle
  - Reversed Carnot Cycle
  - Bell –Coleman Cycle**
675. During Sensible cooling of air, the specific humidity

- a) Increases
- b) decreases
- c) **remains constant**
- d) cannot be determined by this relation

676. An ice plant produces 10 tonnes of ice per day at 0°C using water at room temperature of 20°C. The theoretical refrigerator capacity (TR) of the plant will be .....

- a) 10.85
- b) 11.85
- c) 12.85
- d) **13.85**

677. The theoretical power rating of the compressor motor will be .....if the COP of the plant is 2.5

- a) 9.38
- b) **19.38**
- c) 29.38
- d) 39.38

678. In which type of material, the band gap is far away from conduction band and valence band

- a) Conductor
- b) Semiconductor
- c) **Insulator**
- d) None of these

679. The impure silicon crystal is called .....

- a) Intrinsic
- b) **Extrinsic**
- c) Semiconductor
- d) Insulator

680. N-type semiconductor is made by doping .....

- a) Trivalent
- b) Tetravalent
- c) **Pentavalent**
- d) Hexavalent

681. The majority charge carriers in P-type semiconductor are .....

- a) Protons
- b) Neutrons
- c) Electrons
- d) **Holes**

682. The layer which is exposed to the solar radiation is .....

- a) P-type layer
- b) **N-type layer**
- c) Depletion Region
- d) PN Junction

683. When the sun light/photon strikes the solar cell, the electron hole pair is generated on...

- a) N-region
  - b) P-region
  - c) **Both regions**
  - d) PN junction
684. When PV Modules are attached in series, the output current will .....
- a) Increase
  - b) Decrease
  - c) **Remain same**
  - d) double
685. Normally, one solar cell produces.....
- a) 1V
  - b) 5V
  - c) 0.125V
  - d) **0.5V**
686. When the solar irradiance is increased, or decreased, the major effect cause change in.....
- a) Voltage
  - b) **b) Current**
  - c) c) None of these
  - d) d) Both of these
687. The pentavalent atom is often called .....
- a) **Donor atom**
  - b) Acceptor atom
  - c) Hybrid atom
  - d) Valence atom
688. Which is not a renewable energy resource
- a) Solar
  - b) Hydel
  - c) Geo-thermal
  - d) **Natural gas**
689. Optical losses of solar collector will ..... with the increase in temperature difference of pot content temperature and ambient temperature
- a) Increase
  - b) decrease
  - c) **remain the same**
  - d) depend on fluid to be heated
690. The actual power in the above question will be ..... if the power loss coefficient is - 0.45 %/°C.
- (a) 180 W
  - (b) 190 W**
  - (c) 200 W
  - (d) 210 W
691. Typical values of  $\gamma$  (proportionality constant) range between 25°C and 35°C; that is, in 1 sun of insolation, cells tend to be ..... degrees hotter than their environment.
- (a) 15 – 25°C
  - (b) 25 – 35°C**
  - (c) 35 – 45°C

- (d) None of these
692. A residence needs 3 kW load for electricity for 8 hours per day and average GHI is  $6 \text{ kWhm}^{-2}\text{d}^{-1}$ . Photovoltaic, inverter and battery efficiency is 16%, 92.5% and 90% respectively. (Neglect Temperature correction factor) The area required of PV array required will be .....
- 20
  - 25
  - 30**
  - 35
693. A residence needs 3 kW load for electricity for 8 hours per day and average GHI is  $6 \text{ kWhm}^{-2}\text{d}^{-1}$ . Photovoltaic, inverter and battery efficiency is 16%, 92.5% and 90% respectively. (Neglect Temperature correction factor). The  $\text{kW}_p$  required will be
- 3.8
  - 4.8**
  - 5.8
  - 6.8
694. The amount of energy required to free an electron from the valence band of a silicon atom is .....
- 0.3 eV
  - 0.7 eV
  - 1.12 eV**
  - None of these
695. .... of the Sun lies in the temperate range of 5785 K
- Photosphere
  - Chromosphere
  - Corona**
  - Core
696. The distance between center of the sun to the center of the earth is .....
- $1.39 \times 10^6$
  - $1.49 \times 10^8$**
  - $1.39 \times 10^{18}$
  - $1.49 \times 10^{18}$
697. For the same surface area, vacuum tube collectors are more efficient than the flat plate collectors as the ..... losses become negligible theoretically.
- i) conduction ii) radiation iii) convection
- (i) & (ii) only
  - (ii) & (iii) only
  - (i) & (iii) only**
  - All three losses
698. The optical losses in a flat plate collector having  $1 \text{ m}^2$  area will be ----- if the effective transmittance absorbance product is 0.855 and total GHI are  $1000 \text{ W m}^{-2}$ .
- 45 W
  - 145 W**
  - 245 W
  - 855 W
699. The barrier potential is typically ..... for a silicon diode and ..... for germanium.
- 0.3 V and 0.7 V
  - 0.3 V and 1.12 V
  - 1.12 V and 0.3 V

- d) 0.7 V and 0.3 V**
700. Deep-cycle batteries, such as lead-acid, are used in solar power systems and their capacity is rated in .....
- (a) kWh  
**(b) Ah**  
(c) W  
(d) V
701. If the smooth surface of a reflector and lens can be broken into segments to achieve essentially the same concentration, the resulting concentrator is called
- (a) Fresnel Concentrator**  
(b) Scheffler reflector  
(c) Paraboloidal concentrator  
(d) None
702. For the same surface area, vacuum tube collectors are more efficient than the flat plate collectors as the ..... losses become negligible theoretically.
- i) conduction    ii) radiation    iii) convection
- a) (i) & (ii) only  
b) (ii) & (iii) only  
**c) (i) & (iii) only**  
d) All three losses
703. Actual kW of a pump in solar drip irrigation is calculated by the following formula ..... (where Q in L/s, H in m and  $\eta$  pump efficiency in percentage)
- a)  $P = QH/102 \eta$**   
b)  $P = 9.8 QH/\eta$   
c)  $P = QH/367\eta$   
d)  $P = QH/6122 \eta$
704. Drying rate for grains is directly proportional to the mass flow rate of air and change in ..... of the process line
- a) Enthalpy  
b) Relative humidity  
c) specific volume  
**d) Humidity ratio**
705. The value of air mass, temperature (°C) and solar irradiance (GHI) (W/m<sup>2</sup>) at Standard Testing Condition (STC) PV panels evaluation is taken as .....
- a) 1, 25, 1000  
b) 1.5, 45, 800  
c) 1.5, 20, 1000  
**d) 1.5, 25, 1000**
706. Central receiver collector and heliostat have temperature
- a) 100°C  
**b) 1000°C**  
c) 2000°C  
d) 3000°C
707. The power available in a solar tunnel dryer having 0.1 m<sup>2</sup> cross sectional area, 1 m per second air velocity and 25 K temperature difference of the moving air will be equal to ..... (Take standard figures for air)
- a) 1440 W  
**b) 2840 W**  
c) 3266 W  
d) 4266 W

708. The power available in a solar tunnel dryer having  $0.1 \text{ m}^2$  cross sectional area, 1 m per second air velocity and 25 K. Available power is 2840W. The system efficiency of the solar tunnel dryer will be ----- if the collector area is  $10 \text{ m}^2$  and average solar irradiance is  $800 \text{ W m}^{-2}$ .

- a) 25.5%
- b) 35.5%**
- c) 45.5%
- d) 55.5%

709. Out of all solar collectors, ..... is the most efficient solar collector.

- a) FPC
- b) PTC
- c) ETC**
- d) Fresnel reflector

710. The term heliostat in central receiver collector is used for .....

- a) Automatic trackers
- b) Stationary receiver
- c) Mirrors**
- d) Power unit

711. The ratio of the mass of the atmosphere through which the beam radiation passes to the mass it would pass through if the sun were at zenith.

- a) Tilt angle
- b) Zenith
- c) Air mass**
- d) Radiation ratio

712. One Tonnes of Oil Equivalent (TOE) is approximately equal to .....

- a) 22 GJ
- b) 32 GJ
- c) 42 GJ**
- d) 52 GJ

713. While calculating energy balance of a flat plate collector, the total heat energy will be calculated by summing

i) Optical & thermal losses    ii) Total solar radiation    iii) Stored Energy    (iv) Useful energy

- a) (i) & (ii) and (iii)
- b) (ii) & (iii) and (iv)
- c) (i) & (iii) and (iv)**
- d) All (i) & (ii) (iii) and (iv)

714. Average solar global insolation in Pakistan lies from.....;

- a)  $3\text{-}4.5 \text{ kWh m}^{-2} \text{ d}^{-1}$
- b)  $15\text{-}20 \text{ kWh m}^{-2} \text{ d}^{-1}$
- c)  $1000\text{-}1100 \text{ kWh m}^{-2} \text{ d}^{-1}$
- d)  $5\text{-}7 \text{ kWh m}^{-2} \text{ d}^{-1}$**

715. The angular location of north or south of the equator ranging from -90 to +90 degree is called .....

- a) Longitude
- b) Latitude**
- c) Declination
- d) Slope

716. .... solar systems do not use batteries for backup.

- a) Stand-alone
  - b) Grid Tied**
  - c) Inverter type
  - d) DC based
718. On common globe for earth, planes formed by .....lines are parallel to each other while .....lines are passing through the north and south poles.
- a) Longitude, Latitude,
  - b) Latitude, Longitude,**
  - c) Azimuth, Longitude
  - d) Altitude, Longitude
719. In an MPPT charge controller, the current ..... when battery voltage drops.
- a) Decreases proportionally
  - b) Remains the same
  - c) Becomes zero immediately
  - d) increases proportionally**
720. The peak power of solar panel is rated as ..... (where symbols carry usual meanings)
- a)  $V_{oc} \times I_{sc}$
  - b)  $I_{sc} \times R$
  - c)  $V_{noct} \times I_{sc}$
  - d)  $V_{mp} \times I_{mp}$**
721. A  $100 W_p$  ( $V_{mp} = 18 V$ ;  $I_{mp} = 5.56 A$ ) panel is used to charge the battery from low volts (11 V) to high voltage (14 V). At the time of charging, the power stored in the battery at low and high volts using a PWM charge controller will be .....W respectively.
- a) 97.8 and 99.4
  - b) 61 and 78**
  - c) 78 and 61
  - d) 99.4 and 97.8
722. A  $100 W_p$  ( $V_{mp} = 18 V$ ;  $I_{mp} = 5.56 A$ ) panel is used used to charge the battery from low volts (11 V) to high voltage (14 V). At the time of charging, the power stored in the battery at low and high volts using an MPPT charge controller will be .....W respectively.
- a) 99.4 and 97.8
  - b) 61 and 78
  - c) 78 and 61
  - d) 97.8 and 99.4**
723. The function of charge controller is to.....
- (i) Prevent battery overcharge (ii) Prevent battery discharge when PV voltage drops
  - (iii) Convert DC current to AC current (iv) Maintain the depth of discharge (battery)
- a) (i), (ii) & (iii)
  - b) (i), (ii) & (iv)
  - c) (ii) & (iii)
  - d) (i) & (ii)**
724. One Sun insolation is taken as .....
- a) 99.4 and 97.8
  - b) 61 and 78
  - c) 78 and 61
  - d) 97.8 and 99.4**
725. The capacity of battery bank for an off grid PV system depends upon .....as well as the efficiency of battery and the autonomy.



(i) Ah of battery to be used (ii) Voltage of battery (iii) depth of discharge (iv) Efficiency of battery

- a) (i), (ii) & (iii)
- b) (ii), (iii) & (iv)**
- c) (i) & (ii) & (iv)
- d) (i), (iii) & (iv)

726. For the smooth running of grid-tied system, .....

- a) battery bank should be compatible with load
- b) Utility grid should never be off**
- c) Charge controller should be 1.2 times bigger
- d) All of these

727. The shading impact on PV panels may cause .....

- a) Decrease in power output from PV array
- b) Irreversible damage to modules
- c) Highly localized power dissipation
- d) All of these**

728. For crystalline silicon cells,  $V_{oc}$  ..... by about 0.37% for each degree Celsius increase in temperature, and  $I_{sc}$  .....by approximately 0.05%

- (a) decreases, decreases
- (b) decreases, increases**
- (c) increases, increases
- (d) increases, increases

729. Cell temperature of 230 Wp panel at 47°C NOCT under conditions of 1-sun insolation and ambient temperature 30°C will be .....°C.

- (a) 43.75
- (b) 53.75
- (c) 63.75**
- (d) 73.75

730. The stagnation temperature indicating the maximum thermal stress of the absorber can be calculated from .....

- a) x-intercept**
- b) y-intercept
- c) area
- d) slope

731) All state conditions of atmospheric air can be found out if ..... state point(s) is/are known.

- a) Four
- b) Three
- c) Two**
- d) One

732) During Sensible cooling of air, the specific humidity ...

- a) Decreases
- b) Increases
- c) Cannot be determined by this relationship
- d) Remains constant**

733) The allocation of scarce resources among competing ends is known as:

- a) Management
  - b) Economics**
  - c) Energy Scarcity
  - d) Decision making
- 734) The term Economics basically revolves about how many objectives.
- a) Four
  - b) Five
  - c) One
  - d) Two**
- 735) The concept of National Income Theory also known as:
- a) Managerial Economics
  - b) Normative Economics
  - c) Micro-Economics
  - d) Macro-Economics**
- 736) The concept that different sums of money at different points in time can be said to be equal to each other is known as:
- a) Evaluation criterion
  - b) Equivalence**
  - c) Cash flow
  - d) Intangible factors
- 737) All of the following are examples of cash outflows, except:
- a) Asset salvage value**
  - b) Income taxes
  - c) Operating cost of asset
  - d) First cost of asset
- 738) In most engineering economy studies; the best alternative is the one that:
- a) Will last the longest time
  - b) Is most politically correct
  - c) Is easiest to implement
  - d) Has the lowest cost**
- 739) At an interest rate of 10% per year, the equivalent amount of \$10,000 one year ago is closest to:
- a) \$8264
  - b) \$9091**
  - c) \$11,000
  - d) \$12,000
- 740) The expected rate of return on the unfunded project is called,
- a) opportunity cost**
  - b) Variable cost
  - c) Marginal cost
  - d) None
- 741) For a corporation, the following inequality must be corrected for an accepted project.

- a)  $MARR \leq ROR \geq WACC$
- b)  $ROR \leq MARR \leq WACC$
- c)  **$ROR \geq MARR \geq WACC$**
- d)  $WACC \geq MARR \geq ROR$

742) The time it would take for a given sum of money to double at 4% per year simple interest is closest to:

- a) 30 years
- b) **25 years**
- c) 20 years
- d) 10 years

743) Interest earned over a period of time is expressed as a percentage of the original amount is expressed as:

- a) interest rate
- b) **Rate of Return**
- c) Compound interest
- d) Interest percentage

744) The revenues values in cashflows presented with

- a) negative sign
- b) **positive sign**
- c) MARR
- d) interest value

745) The integral Risk exists in any economic project is presenting in term of:

- a) Weighted average capital cost
- b) rate of return
- c) Debt Financing
- d) **Minimum attractive rate of return**

746) The number of factors involves in a cash flow is:

- a) **five**
- b) three
- c) four
- d) six

747) The formula to find the present values in cash flow is:

- a)  $P = A (1 - i)^{-n}$
- b)  $P = F (1 + i)^{+n}$
- c)  $P = F (1 - i)^{-n}$
- d)  **$P = F (1 + i)^{-n}$**

748) The amount of money that Diamond Systems can spend now for improving productivity in lieu of spending \$30,000 three years from now at an interest rate of 12% per year is closest to:

- a) \$15,700
- b) \$17,800
- c) \$19,300
- d) **\$21,350**

749) The value of the factor (P/F, i,10) can be found by getting the factor values for (P/F,i,4) and ( P/F, i,6):

- a) Adding the values for (P/F, i,4) and ( P/F, i,6)
- b) Multiplying the values for (P/F, i,4) and ( P/F,i,6)**
- c) Dividing the value for (P/F, i,6) by the value for ( P/F, i,4)
- d) None of the above

750) The present worth values are often referred to as:

- a) discounted cash flows**
- b) Net present cash flow
- c) Ascending cash flow
- d) Simple cash flow

751) When only one alternative can be selected from two or more, the alternatives are said to be:

- a) Mutually exclusive**
- b) Independent alternatives
- c) Cost alternatives
- d) Revenue alternatives

752) The concept of the least common multiple method involves when the economic alternatives have:

- a) equal life
- b) different life**
- c) life gap
- d) None

753) Capitalized cost is PW of project with infinite life which represents as:

- a)  $A * i$
- b)  $A + i$
- c)  $A / i$**
- d)  $P / A$

754) One assumption inherent in the present worth method of analysis is that:

- a) The alternatives will be used only through the life of the shortest-lived alternative.
- b) The alternatives will be used only through the life of the longest-lived alternative.
- c) The cash flows of each alternative will change only by the inflation or deflation rate in succeeding life cycles.**
- e) At least one of the alternatives will have a finite life.

755) For the mutually exclusive alternatives shown, the one(s) that should be selected are:

Alternative	PW, \$
A	- 25,000
B	- 12,000
C	10,000
D	15,000

- a) Only C
- b) Only A
- c) Only B

**d) Only D**

756) The present worth of \$50,000 now, \$10,000 per year in years 1 through 15, and \$20,000 per year in years 16 through infinity at 10% per year is closest to:

- a) Less than \$ -169,000
- b) \$ -169,580
- c) \$ -173,940**
- d) \$ -195,730

757) All of the following are fundamental assumptions for the annual worth method of analysis except:

- a) The alternatives will be needed for only one life cycle.**
- b) The services provided are needed for at least the LCM of the lives of the alternatives.
- c) The selected alternative will be repeated for the succeeding life cycles in exactly the same manner as for the first life cycle.
- d) All cash flows will have the same estimated values in every life cycle.

758) When comparing FIVE alternatives that have different lives by the AW method, you must:

- a) Find the AW of each over the life of the longest-lived alternative.**
- b) Find the AW of each over the life of the shortest-lived alternative.
- c) Find the AW of each over the LCM of all of the alternatives.
- d) Find the AW of each alternative over its life without considering the life of the other alternatives.

759) The annual worth of an alternative can be calculated from the alternative's:

- a) Present worth by multiplying by  $(A/P, i, n)$**
- b) Future worth by multiplying by  $(F/A, i, n)$
- c) Either (a) or (b)
- d) Neither (a) nor (b)

760) To get the AW of a cash flow of \$10,000 that occurs every 10 years forever, with the first one occurring 10 years from now, you should:

- a) Multiply \$10,000 by  $(A/P, i, 10)$ .
- b) Multiply \$10,000 by  $(A/F, i, 10)$ .**
- c) Multiply \$10,000 by  $i$ .
- d) Multiply \$10,000 by  $(A/F, i, n)$  and then multiply by  $i$ .

761) All the following statements about the capital recovery amount for an alternative are false except:

- a) Annual revenue can be no more than this amount if the alternative is selected.
- b) A monetary estimate of new capital funds required each year for the life of the alternative.
- c) An amount of revenue required to recover the first cost plus a stated return over the life of the alternative.**
- d) Does not consider the salvage value since it is returned at the end of the alternative's life.

762) For the policy level guidelines for the mineral sector, which policy is formed?

- a) National Resources Policy
- b) National Mineral Policy**
- c) National Legislation Policy
- d) National Regulation Policy

763) Demand is determined by

- a) Price of the product
- b) Relative prices of other goods
- c) Tastes and habits
- d) All of the above**

764) Managerial economics generally refers to the integration of economic theory with business

- a) Ethics
- b) Management
- c) Practice**
- d) All of the above

765) Given the price, if the cost of production increases because of higher price of raw materials, the supply

- a) Decreases**
- b) Increases
- c) Remains same
- d) Any of the above

766) The demand curve has a \_\_\_\_\_ slope.

- a) Undefined
- b) Zero
- c) Negative**
- d) Positive

767) Goods produced on small scale have

- a) Relatively inelastic supply**
- b) Highly elastic supply
- c) Perfectly elastic supply
- d) None of the above

768) If the demand for a good is inelastic, an increase in its price will cause the total expenditure of the consumers of the good to

- a) increases**
- b) decreases
- c) remains the same
- d) none of the above

769) A measure of the overall efficiency of a home/plant is called

- a) Energy efficiency rating**
- b) Energy utilization ratio
- c) Energy use index
- d) Overall energy consumption

- 770) Dividing total electricity (KWh) used in the month by the peak demand (KW) then divide by the number of days in the billing cycle then divide by 24 hours in a day give
- a) Rated energy
  - b) Energy factor
  - c) Energy use index
  - d) **Load factor**
- 771) Adjusting your day-to-day behaviors to reduce energy consumption is a type of
- a) Energy audit and management
  - b) **Energy conservation**
  - c) Energy management
  - d) Energy savage practices
- 772) A building inspector who provide consultations on energy efficiency called
- a) Energy manager
  - b) Building auditor
  - c) **Energy auditor**
  - d) Energy administrative
- 773) The percentage of energy saved at the current rate of use compared to the reference year rate of use is called
- a) Energy index
  - b) **Energy performance**
  - c) Energy conservation rate
  - d) Energy improvement
- 774) A process of cleaning, transforming, and modeling data to discover useful information for business decision-making is called
- a) Curve fitting
  - b) Modelling data
  - c) Standard Deviation
  - d) **Data analysis**
- 775) Most utility companies measure natural gas in--- and convert to therms.
- a) PPM of cubic feet (Ccf)
  - b) Therms cube
  - c) Cubic feet (Ccf)
  - d) **Thousands of cubic feet (Mcf)**
- 776) The measure that tell how spread out a normally distributed set of data is called
- a) Normal distribution
  - b) Data analysis
  - c) **Skewness**
  - d) Standard deviation
- 777) Energy consumed by a 50 kW motor loaded at 40 kW over a period of 4 hours
- a) **160 kWh**
  - b) 2000 kWh
  - c) 40 kWh
  - d) 50 kWh

- 778) The Forecasting time horizons include:
- long range.
  - medium range.
  - short range.
  - all of the above**
- 779) The Qualitative methods of forecasting include:
- sales force composite
  - jury of executive opinion
  - consumer market survey
  - all of the above.**
- 780) The main difference between simple and multiple regression is -----.
- dependent variables
  - independent variables**
  - exponential variables
  - all of the above
- 781) The tracking signal is the:
- standard error of the estimate.
  - mean absolute percent error (MAPE).
  - mean absolute deviation (MAD).
  - ratio of the cumulative error to MAD.**
- 782) In the framework of policy principles, the Government of Pakistan has designed how much strategies to actualize its vision?
- Five
  - Seven
  - Nine**
  - Three
- 783) One of the primary characteristics of the Delphi Method is:
- obscurity
  - grey
  - anonymity
  - both a) and b)**
- 784) The main objectives of integrated energy planning are:
- Socio, Economic and Environmental development**
  - Environment, technology, and diversity planning
  - Supply, Security and Energy Efficiency
  - All the above
- 785) Integrated Energy Planners used which type of technique to develop their policies.
- Top-down technique
  - Bottom-up technique
  - Both a and b**
  - None of these



- 786) The principles of energy policy are:
- a) Energy, competition and sustainability
  - b) Efficiency, competition and sustainability**
  - c) Energy efficiency, security and sustainability
  - d) Efficiency, Development and Environment
- 787) The abbreviation of Energy Modeling tool LEAP is:
- a) Locals Engagement Analysis Program and Simulation
  - b) Local Education Agency Plan
  - c) Lifetime Economic Acceleration Process
  - d) Long-range Energy Alternatives Planning System**
- 788) The energy sources, that are either found or stored in nature are
- a) Secondary Energy Sources
  - b) Primary Energy Sources**
  - c) Tertiary Energy Sources
  - d) None of these
- 789) Energy manager should be well versed with
- a) Manufacturing and processing skills
  - b) Managerial and technical skills**
  - c) Technical and marketing skills
  - d) Managerial and commercial skills
- 790) “The judicious and effective use of energy to maximize profits and enhance competitive positions”. This can be the definition of:
- a) Energy conservation
  - b) Energy management**
  - c) Energy policy
  - d) Energy Audit
- 791) An energy policy does not include
- a) Target energy consumption reduction
  - b) Time period for reduction
  - c) Declaration of top management commitment
  - d) Future production projection**
- 792) The expected energy efficiency improvement by 2030 by Energy Efficiency and Conservation Program of Pakistan is
- a) 20%**
  - b) 30%
  - c) 25%
  - d) 22%
- 793) Which of the following is not a forecasting technique?
- a) Judgmental
  - b) Time series
  - c) Time horizon**
  - d) Associative

794) The demand for period t-2 and t-1 is 10 and 12 cases respectively. As per naïve method, the demand for next period 't' is

- a) 10
- b) 11
- c) 12**
- d) 14

795) Calculate four periods moving average forecast from the last six period

Period Demand

1	38
2	40
3	42
4	40
5	44
6	38

- a) 40
- b) 41**
- c) 42
- d) 43

796) If the actual demand for a period is 100 units but forecast demand was 90 units. The forecast error is

- a) -10
- b) +10**
- c) -5
- d) +5

797) Calculate a weighted average forecast using a weight of .50 to the most recent period, .40 for the next recent period and .30 for the next period

Period Demand

1	38
2	40
3	42
4	40
5	44
6	38

- a) 46.6
- b) 47.6
- c) 48.6**
- d) 49.6

798) A linear trend equation has the form

- a)  $F=a - bt$
- b)  $F=a + bt$**
- c)  $F=2a - bt$
- d)  $F=2a + bt$

799) Which of the following method is suitable for forecasting the demand of a product?

- a) **Delphi method and judgmental method**
- b) Market research and judgmental method
- c) Delphi method
- d) only (c)

800) Which one of the following does not fall under qualitative forecasting method?

- a) Life cycle analogy
- b) Delphi method
- c) Market research
- d) **Moving average methods**

801) The measure of forecast error which calculates the average of absolute differences between the actual and the forecast demand over n time periods is known as:

- a) **mean absolute deviation**
- b) mean absolute percentage error
- c) mean-square error
- d) mean square percent error

802) The measure of forecast error which calculates the average of square of the forecast errors is known as:

- a) mean absolute deviation
- b) mean absolute percentage error
- c) **mean-square error**
- d) mean square percent error

803) The sales manager had predicted before the new model was introduced that first year sales would be 410 VWs. Using exponential smoothing with a weight of a 0.30, develop forecasts for years 2.

Year	Sales	Forecast
1	450	410
2	495	?

- a) **422.0**
- b) 448.9
- c) 466.1
- d) 418.9

804) Average demand for iPods in the Rome, Italy, Apple store is 800 units per month. The May monthly index is 1.25. What is the seasonally adjusted sales forecast for May?

- a) 640 units
- b) 798.75 units
- c) 800 units
- d) **1,000 units**

An engine having equal bore and stroke is known as

- a) **Square engine**
- b) Equal engine
- c) Parallel engine
- d) None of these

805) Calculate by mass air to fuel ratio of  $C_8H_{18}+O_2$

- a) 13.0/1

- b) **15.2/1**  
c) 17. 3/1  
d) 19.2/1
- 806) How much oxygen is required to burn 1 kg of C<sub>8</sub>H<sub>18</sub>?  
a) 10  
b) 25  
c) **12.5**  
d) 15.5
- 807) Replacement of burnt gases with air fuel mixture is known as  
a) Suction  
b) Reciprocation  
c) Pre compression exhaust  
d) **Scavenging**
- 808) How much volume will be displaced if crankshaft completes one revolution?  
a) One full stroke  
b) Half stroke  
c) **Two full stroke**  
d) One third of stroke
- 809) A turbocharger can increase engine power by increasing  
a) Air volume  
b) **Air pressure than atmosphere**  
c) Air quantity  
d) Air pressure than cylinder
- 810) Which of the following is not the part of engine  
a) Piston pin  
b) Tappet  
c) **Clutch plate**  
d) Oil pan
- 811) Which type of hole does not associated with engine block  
a) **Piston pin hole**  
b) Stud hole  
c) Push rod hole  
d) Cylinder bore
- 812) Which of the following is not described as piston nomenclature  
a) Piston pin bore  
b) Skirt  
c) Window  
d) **Snap ring**
- 813) Connecting rods are assembled with crankshaft at  
a) **Crankpin journals**  
b) Main journals  
c) Main bearing journal  
d) Crank nose

- 814) Camshaft regulates
- Crank timing
  - Fuel quantity
  - Valve timing**
  - Engine speed
- 815) The air gap between electrodes of spark plug is kept
- 0.55 mm
  - 0.55 cm
  - 0.55 in**
  - 0.55  $\mu\text{m}$
- 816) Calculate the BHP of a 4 stroke, 4 cylinder I.C. Engine which has cylinder bore of 14 cm, stroke length of 16 cm, crankshaft speed of 1100 rpm, frictional horse power of 30 percent of IHP, and mean effective pressure is 8 kg/cm<sup>2</sup>
- 66.4
  - 67.5**
  - 64.6
  - 70.0
- 817) An engine has a bore of 100 mm and stroke of 124 mm. Calculate Total cylinder volume and compression ratio if  $CV = PD/6$ .
- 0.97 liter
  - 0.16 liter
  - 1.13 liter**
  - 0.81 liter
- 818) Compression ratio CR is described as
- PD/CV
  - CV/TCV
  - PD/TCV
  - TCV/CV**
- 819) The word tractor is given due to its property of
- Hitching
  - Traction**
  - Crawling
  - Ploughing
- 820) A low medium horsepower tractor usually used for pulling auxiliary equipment is called
- Implement carrier
  - Industrial tractor
  - Utility tractor**
  - Rotary tiller
- 821) A walk behind tractor usually have
- Two traction wheel drive**
  - Four drive wheel
  - Two steering wheel drive
  - Four traction cum steering wheel drive

822) A compressed, homogeneous air-fuel mixture is ignited using a spark with air fuel ratio of

- a) **15 to 1 by mass**
- b) 9 to 1 by volume
- c) 18 to 1 by mass
- d) 25 to 1 by volume

823) The engine in which ignition starts due to high pressure and temperature is

- a) Spark ignition engine
- b) **Compression ignition engine**
- c) steam engine
- d) Sterling engine

824) In a four cycle heat engine (suction, compression, combustion exhaust), the type of engine in which two processes of cycle occurring simultaneously.

- a) Two stroke petrol engine
- b) Two stroke diesel engine
- c) **both two stroke CI and SI engines**
- d) None of these

825) Gasoline engine works on the principle of

- a) Carnot cycle
- b) Diesel cycle
- c) **Otto cycle**
- d) None of these

826) Weight to horse power ratio is high in

- a) Petrol engine
- b) **Diesel engine**
- c) Two stroke engine
- d) Dual combustion engine

827) In CI engines compression pressure and temperature reaches about

- a) 4 bar, 800 degree C
- b) 4 psi, 800 degree F
- c) 4 kPa, 800 K
- d) **4 MPa, 800K**

828) A valve timing diagram is generally expressed as angular position of

- a) Camshaft
- b) **Crankshaft**
- c) Fly wheel
- d) Rocker arm

829) In two stroke engine, scavenging process is completed theoretically on valve timing diagram in

- a) 60 degree
- b) 90 degree
- c) **120 degree**

- d) 180 degree
- 830) During suction stroke what supports suction inside cylinder
- a) **Vacuum**
  - b) High pressure
  - c) Low pressure
  - d) Balanced pressure
- 831) A dirty silencer can reduce engine efficiency due to
- a) Back pressure during exhaust stroke
  - b) Offer resistance to exhaust gases to expel
  - c) Reduce pressure difference between cylinder and silencer
  - d) **All of these**
- 832) Refers to actual valve timing diagram, inlet valve remains open in four stroke petrol engine
- a) 10 to 20 degree
  - b) 30 to 40 degree
  - c) **220 to 240 degree**
  - d) 180 degree
- 833) In actual valve timing diagram the position in which both valve remain open is called
- a) Valve timing
  - b) **Valve overlap**
  - c) Tappet clearance
  - d) None of these
- 834) The combustion temperature inside cylinder may reach up to
- a) 200 to 250 degree C
  - b) 600 to 800 degree C
  - c) 1000 to 1200 degree C
  - d) **1500 to 2400 degree C**
- 835) Engine cooling system must be capable of removing what percent of generated heat
- a) 10
  - b) **30**
  - c) 50
  - d) 70
- 836) In air cooling system, fins are provided for efficient cooling is due to increased
- a) Engine size
  - b) Intake capacity
  - c) **Contact area**
  - d) Coolant speed
- 837) Which one is not the part of thermosyphen cooling system?
- a) Radiator
  - b) Fan
  - c) Water jackets
  - d) **Thermostat**

- 838) By putting pressure cap over radiator upper tank the boiling temperature of water increase up to
- a) 212 degree F
  - b) 243 degree F**
  - c) 100 degree C
  - d) 273 K
- 839) Standard thermostats are designed to start opening at
- a) 70 to 75 degree C**
  - b) 75 to 80 degree C
  - c) 80 to 90 degree C
  - d) 90 to 90 degree C
- 840) Fuel tank at the top covered with a vented cap is due to
- a) Create high pressure inside tank, when vehicle is air locked
  - b) Maintain atmospheric pressure inside tank**
  - c) Kept air tight fuel tank
  - d) Remove fuel vapors from tank
- 841) Which is a device, which breaks down the petrol into tiny particles and then mixes it with air
- a) Fuel injection pump
  - b) Fuel injector
  - c) Carburetor**
  - d) Fuel lift pump
- 842) A closed choke allows to enter what enriched air fuel ratio of by mass inside petrol engine
- a) 8:1
  - b) 12:1**
  - c) 16:1
  - d) 18:1
- 843) A throttle valve in carburetor is provided for controlling
- a) Air speed
  - b) Fuel speed
  - c) Air fuel mixture**
  - d) None of these
- 844) Zenith carburetor is a type of
- a) constant depression carburetor
  - b) Closed choke carburetor
  - c) Variable choke carburetor
  - d) Constant choke carburetor**
- 845) In air injection system, the rate of fuel injected is controlled by
- a) Varying air injection pressure**
  - b) Varying fuel injection pressure
  - c) Varying air fuel mixture pressure



- d) Varying pump speed
- 846) In mist type lubrication system, what Percent lubricant is mixed with fuel
- a) 1 to 2
  - b) 4 to 6
  - c) 3 to 6**
  - d) 5 to 8
- 847) Splash type lubrication system used in
- a) Heavy duty engines
  - b) Light duty engines**
  - c) Petrol engine
  - d) Diesel engine
- 848) Which one is not the type of fuel injection nozzle?
- a) Pintle
  - b) Pintaux
  - c) Hollow cone**
  - d) Single hole
- 849) Select grade of oil that indicate use for gear and transmission
- a) SAE 30
  - b) SAE 40
  - c) SAE 140**
  - d) SAE 10
- 850) In oil bath air cleaner oil is first entered into which part of filter and removes dust and sand particles
- a) Oil bath**
  - b) Wire mesh
  - c) Paper filter
  - d) Intake manifold
- 851) Fuel injector starts injection and atomize fuel into the cylinder at a pressure of
- a) 1600 psi
  - b) 2600 psi**
  - c) 100 bar
  - d) 100 kPa
- 852) In IC engine during combustion process take place due to
- a) Exothermic chemical reaction inside Intake manifold
  - b) Endothermic chemical reaction inside cylinder
  - c) Exothermic chemical reaction inside combustion chamber**
  - d) Endothermic chemical reaction inside Intake manifold
- 853) Which of the following terms is not true for air filters in IC engines?
- a) Protects engine from two sources of containment
  - b) Enhance air fuel consumption**
  - c) Work as a silencer
  - d) Protects backfiring

- 854) Which component in IC engine regulates air fuel ratio?  
 a) Engine stroke  
 b) Cam shaft  
 c) Crankshaft  
 d) **Throttle body**
- 855) Which one is not the type of intake manifold?  
 a) **Plenum manifold**  
 b) Siamese runner manifold  
 c) Dual plane manifold  
 d) Individual runner manifold
- 856) Which one is not the part of exhaust system?  
 a) Exhaust manifold  
 b) **Plenum**  
 c) Muffler  
 d) Catalytic converter
- 857) Which one of the following function performed by catalytic convertor?  
 A. Smoothens the vibration of exhaust gases  
 B. Controls the flow of exhaust gasses  
 C. **Oxidise carbon monoxide**  
 D. Oxidise Nitrogen
- 858) Which one of the following is not the function of turbocharger  
 A. **Increase velocity of intake air**  
 B. Increase volumetric efficiency  
 C. Increase power  
 D. Increase amount of density provided
- 859) Glow plug is used to heat up intake air when air temperature goes  
 A. Above 25 degree C  
 B. **Below 25 degree C**  
 C. Between 30 to 35 degree C  
 D. Below freezing point
- 860) The fault in secondary ignition circuit in IC engine can cause  
 A. **Miss firing**  
 B. Engine knock  
 C. Back firing  
 D. No stat condition
- 861) When the coil\_\_\_\_\_ lead is grounded, the \_\_\_\_\_ circuit of the coil is completed  
 A. Positive, Secondary  
 B. Negative, Secondary  
 C. Positive, Primary  
 D. **Negative, Primary**
- 862) When current starts to flow into ignition coil, an opposing current is created known as

- A. Self induction
- B. Mutual induction
- C. Inductive reactance**
- D. Saturation

863) Which one is the part of primary ignition circuit?

- A. Distributor
- B. Pick up coil**
- C. Spark plug
- D. All of these

864) The ignition in the cylinder takes a certain amount of time usually

- A. 0.03 s
- B. 3/1000 ms
- C. 0.003 s**
- D. 0.003 ms

865) The burning of the air-fuel mixture should end by

- A. 5 degree before TDC
- B. 10 degree after TDC**
- C. 10 degree after BDC
- D. 5 degree after BDC

866) In self start ignition system, to start engine the starter motor converts \_\_\_\_\_ to \_\_\_\_\_.

- A. Electrical to mechanical rotational energy**
- B. Electrical to thermal energy
- C. Electrical to chemical energy
- D. Electrical linear mechanical energy

867) When the ignition switch is turned on current flows through \_\_\_\_\_ of solenoid and produced magnetic field

- A. Primary coil
- B. Secondary coil
- C. Windings**
- D. starter motor plunger

868) To crank engine the starter motor draws current of

- A. 15 to 20 A
- B. 60 to 65 A
- C. 80 to 100 A
- D. 150 to 200 A**

869) How does the starter motor grounded?

- A. Via vehicle tires
- B. Via battery negative terminal**
- C. Via insulators
- D. Via Radiator

870) Which of the following is not true for clutches in transmission system of vehicle

- A. Regulates the power transmission**
- B. Act as coupling between two rotating shafts
- C. Allows the transmission of power between two shafts rotating at different speeds
- D. Allows to engage different speed gear by disconnecting engine power.

871) Clutch works on the principle of

- A. Mechanical energy transformation
- B. Energy conversion and transformation
- C. Friction**
- D. Momentum

872) Which of the following shaft is rotated as single unit with all set of gears

- A. Lay shaft**
- B. Power shaft
- C. Drive Shaft
- D. Differential shaft

873) Which of the following shaft always rotating when vehicle is standing idle with engine running?

- A. Lay shaft
- B. Clutch shaft
- C. Crank Shaft
- D. All of these shafts**

874) Which of the following gear system, transmission gear does not always attached to lay gear?

- A. Sliding mesh type**
- B. Constant mesh type
- C. Sliding mesh type
- D. None of these

875) Which one of the following gear of differential system allows different speeds of final drive?

- A. Pinion
- B. Spider**
- C. Crown
- D. Speed reduction

876) The ignition in dual fuel engine starts on the principle of

- A. Otto cycle
- B. Diesel cycle**
- C. Stirling cycle
- D. Carnot cycle

877) Typical diesel fuel efficiency is \_\_\_\_\_ % and dual fuel efficiency is \_\_\_\_\_ %

- A. 41, 25
- B. 25, 38.5
- C. 38.5, 41
- D. 41, 38.5**

- 878) Dual fuel engine is \_\_\_\_\_ efficient than conventional diesel engine at full load
- A. **Slightly more**
  - B. Slightly less
  - C. Equally
  - D. Highly
- 879) Dual fuel engines produces \_\_\_\_\_ power, when operating on diesel as compared to gaseous fuel
- A. Slightly more
  - B. Slightly less
  - C. **Equal**
  - D. Higher
- 880) Which one of the following is not true for dual fuel engine?
- A. Produces 25 to 30 % lower carbon dioxide
  - B. Produces 85 % lower NO<sub>x</sub>
  - C. **Produces 10 % lower SO<sub>x</sub>**
  - D. Produces smoke with no color
- 881) When needed, dual fuel engine can be operated on \_\_\_\_\_ diesel
- A. 5 %
  - B. 95 %
  - C. **100 %**
  - D. 0 %
- 882) Dual fuel engine operates at \_\_\_\_\_ fuel gas and \_\_\_\_\_ diesel
- A. **95 %, 5 %**
  - B. 5 %, 95 %
  - C. 100 %, 0 %
  - D. 0 %, 100 %
- 883) Dual fuel engine can save operational cost approximately
- A. 5 %
  - B. 25 %
  - C. **30 %**
  - D. 50 %
- 884) Ballasting is a process to control
- A. Excessive draft
  - B. **Slippage**
  - C. Implement position
  - D. Weight of implement
- 885) Tire Inflation pressure maintained at \_\_\_\_\_ level, ensures safe operation and long life of tires
- A. Maximum
  - B. **Minimum**
  - C. Intermediate
  - D. None of these

- 886) Properly ballasted tires can result in
- A. Higher compaction of soil
  - B. Lower Compaction on soil**
  - C. Maximum forces on soil
  - D. Maximum forces on tires
- 887) With properly ballasted and inflated tires, the tractor delivers maximum power to the soil at speeds of
- A. 4 to 5 kmph
  - B. 6.5 to 8 Mph
  - C. 4 to 5 Mph**
  - D. 8 to 15 kmph
- 888) Tractor parameters are commonly optimized to allow \_\_\_\_\_ percent slip
- A. 4 to 5
  - B. 8 to 15**
  - C. 6 to 8
  - D. 5 to 10
- 889) A tractor tire takes 20 revolutions to cover marked distance without load and 18.5 revolution with load, how much tire have been slipped?
- A. 5%
  - B. 6.5%
  - C. 7.5%**
  - D. 8%
- 890) In non-positive displacement pump works generally at \_\_\_\_\_ pressure and \_\_\_\_\_ flow rate
- A. High, Low
  - B. Low, High**
  - C. Minimum, Maximum
  - D. Highest, Lowest
- 891) Which of the followings is not classified as hydraulic valves
- A. Pressure control valve
  - B. Flow control valve
  - C. Direction control valve
  - D. Solenoid valve**
- 892) Which of the followings in tractor is used controlling depth of the implements?
- A. Position control
  - B. Draft control**
  - C. Flow control
  - D. Direction control
- 893) The maximum operating pressure of positive displacement pump is
- A. 80 MPa
  - B. 600 Psi
  - C. 100 kPa
  - D. 200 Bars**

894) During field operation, which tractor gear should be best option to engage of the following?

- A. High 1st speed gear
- B. Low 4th speed gear
- C. Low 2nd speed gear**
- D. High 3rd speed gear

895) If a gear with 8 teeth rotating at 60 rpm, what will be the speed of gear with 24 teeth?

- A. 20 rpm**
- B. 50 rpm
- C. 100 rpm
- D. 180 rpm

896) What will be the gear ratio of gears, if gear speed is 540 rpm and pinion speed is 90 rpm

- A. 2
- B. 4
- C. 6**
- D. 8

897) Calculate the torque produced by PTO gear with 48 teeth rotating at 1100 rpm, if main gear with 56 teeth rotating at 1600 rpm and producing torque 2400 Nm

- A. 3491 Nm**
- B. 1650 Nm
- C. 943 Nm
- D. 1866 Nm

898) If main gear with 56 teeth rotating at 1600 rpm and producing torque 200 ft lb, how much net power available at PTO gear with 48 teeth rotating at 1100 rpm? Assume zero transmission losses.

- A. 42 hp
- B. 61 hp**
- C. 17 hp
- D. 10 hp

899) Find pitch diameter of ring gear, if centre distance is 30 mm and pitch diameter of planetary gear is 36 mm

- A. 60 mm
- B. 96 mm**
- C. 30 mm
- D. 3 mm

900) External combustion engine is

- A. Steam engine**
- B. Petrol engine
- C. Diesel engine
- D. Both petrol and diesel engines

901) In constant pressure combustion (CPC), the fuel is ignited

- A. In the cylinder

- B. Due high compression**  
 C. By spark  
 D. None of these
- 902) In 4 stroke diesel engine, during power stroke, the  
**A. Inlet and exhaust valves are closed**  
 B. Exhaust valve is opened  
 C. Exhaust is closed  
 D. Inlet valve is opened
- 903) Power factor can be defined as  
 a) Sine of voltage and current.  
 b) Co-sine of angle between voltage and current  
 c) Ratio of resistance versus impedance.  
**d) Both options B and C**
- 904) Cam shaft is driven by  
**A. Crank shaft**  
 B. Drive wheel  
 C. Piston  
 D. Piston rod
- 905) In 4 stroke engine, the speed of cam shaft is exactly \_\_\_\_\_ the speed of crank shaft  
**A. Half**  
 B. Full  
 C. Double  
 D. None
- 906) Air cooled tractors are more suitable for the areas of  
 A. Hot climate  
 B. Desert land  
**C. Cold climate**  
 D. None of these
- 907) Which of the following, is not the component of power transmission system  
 A. Rear axle and differential  
 B. Rear drive  
**C. Front wheel**  
 D. Clutch
- 908) The average temperature of engine at which thermostat valve opens is  
 A. 70 to 80 degree C  
 B. 95 to 105 degree C  
**C. 85 to 95 degree C**  
 D. 100 to 110 degree C
- 909) Compression ratio can be calculated using the formula (I.  $TCV/CV$ ; II.  $(PD/CV) + 1$ , III.  $CV/TCV$ , IV-  $PD/CV$ ).  
**a) I and II only**  
 b) I and III only  
 c) I, II and IV



- d) I, II and III
- 910) The process of breaking up or a liquid into fine droplets by spraying is called
- Vaporization
  - Carburetion
  - Ionization
  - Atomization**
- 911) Which type of lubrication system uses nozzle sprayer for lubrication of external parts?
- Splash
  - Forced circulation
  - Combine system**
  - None of these
- 912) Engine size is taken by
- Bore and Stroke**
  - Diameter and Length
  - PD and CV
  - TCV
- 913) Two stroke engine have more \_\_\_\_\_ while 4 stroke is more \_\_\_\_\_ comparatively
- Powerful
  - Strong
  - Powerful, strong
  - Speed, efficient**
- 914) Cooling system has following components. (i. Radiator, ii. Intake and exhaust valve, iii. Oil bath and water pump, iv. Thermostat valve)
- I and III
  - I only
  - I and IV**
  - III only
- 915) Fuel injection system has following components. (i. Intake and exhaust valves, ii. Fuel lift pump, iii. Thermostat valve, iv. Atomizer)
- I and III
  - III only
  - I and II
  - II and IV**
- 916) \_\_\_\_\_ is provided inside the cylinder to facilitate cheaper over-hauling of engine
- Tappet cover
  - Cylinder Liner**
  - Piston
  - None of these
- 917) \_\_\_\_\_ prevents the combustion pressure from entering into the crankcase.
- Oil rings

- b) Compression rings**
- c) Oil strainer
- d) Sleeve

918) The \_\_\_\_\_ design is one in which the entry and exit valves and ports are contained in the cylinder head

- a) I head**
- b) T head
- c) L head
- d) F head

919) A camshaft with 0.468 in. of valve lift with a 1.5 rocker ratio has \_\_\_\_\_ of lobe lift. When tappet clearance is 0.35mm (0.0138 in).

- a) 0.3122 in
- b) 0.3212 in**
- c) 0.3121 in
- d) 0.3221 in

920) The inlet valve begins to open 5 to 20 degree C before the piston reaches the TDC during the end of exhaust stroke

- a) 5 to 30 degree C
- b) 15 to 20 degree C
- c) 25 to 40 degree C
- d) 5 to 20 degree C**

921) Change the cylinder sleeve only if the value of taper and ovality is more than

- a) 0.100 inch
- b) 0.010 inch
- c) 0.011 inch
- d) 0.001 inch**

922) Fuel injection pump is used to develop the high fuel pressure of over \_\_\_\_\_ in the injection system and to regulate the amount of fuel discharged into the cylinder in order to control engine speed

- a) 145 to 180 kg/cm<sup>2</sup>
- b) 140 to 180 kg/cm<sup>2</sup>
- c) 120 to 160 kg/cm<sup>2</sup>
- d) None**

923) To start the injection of fuel into the cylinder when the fuel pressure of about \_\_\_\_\_ is reached

- a) 2600psi**
- b) 2400psi
- c) 2500psi
- d) 2700psi

924) A fully charged battery will test at 1.275 to 1.280 while a discharged battery will read in the \_\_\_\_\_ range

- a) 1.104
- b) 1.140**

- c) 1.275
  - d) 1.410
- 925) Which part of engine involves in pressure leakage during compression?
- a) Piston
  - b) Cylinder head
  - c) **Valves**
  - d) None
- 926) The temperature at which oil flow ceases is
- a) Flash point
  - b) **Pour point**
  - c) Stability
  - d) Smoke point
- 927) The volatility of fuel effects
- a) **Speed of engine**
  - b) Power of engine
  - c) Efficiency of engine
  - d) All of above
- 928) The work of choke is
- a) Supply of rich mixture
  - b) Supply the air into cylinder
  - c) Supply of electric spark
  - d) All of above
- 929) Function of carburetor is
- a) To mix the air and fuel
  - b) To regulate air fuel ratio at different speed
  - c) To supply correct amount of mixture
  - d) **All of above**
- 930) In thermo siphon system, fan is operated by
- a) Camshaft
  - b) Connecting rod
  - c) Fly wheel
  - d) **None of above**
- 931) Electrolyte is consists of
- a) Sulphuric acid
  - b) Distilled water
  - c) HCL and water
  - d) **Sulphuric acid and water**
- 932) Heat exchangers in which the flowing fluids are separated by certain thickness is
- a) Direct heat exchangers
  - b) Indirect heat exchangers
  - c) **Recuperators**
  - d) Regenerators

- 933) The heat transferred from bowl of the spoon to the handle that contains liquid is due to
- a) Conduction**
  - b) Convection
  - c) Radiation
  - d) Filtration
- 934) The principle operation of heat exchanger usually depends on
- a) Slow heating
  - b) Flash heating
  - c) Direct heating
  - d) Indirect heating**
- 935) When two liquids of varying temperature flow through any heat exchanger. The best heat transfer occurred when both liquid flows in
- a) Radial direction
  - b) Concurrent direction
  - c) Countercurrent**
  - d) All of these
- 936) The heat transfer through 1m<sup>2</sup> area per 1C of temperature differential is determined by
- a) Overall heat transfer coefficient
  - b) Temperature coefficient
  - c) Friction coefficient
  - d) All of these**
- 937) The mode of heat transfer through double pipe heat exchanger is through
- a) Conduction
  - b) Convection
  - c) Radiation
  - d) Advection**
- 938) Which of the following fouling type is not occurred in heat exchanger  
Precipitation
- a) Chemical
  - b) Biological
  - c) Precipitation
  - d) None of these**
- 939) The heat transferred in a vacuum is propagated through
- a) Conduction
  - b) Convection
  - c) Radiation**
  - d) Advection
- 940) The greenhouse effect will be observed to be higher at higher transfer of energy through
- a) Conduction
  - b) Convection
  - c) Radiation**
  - d) All of these

- 941) As the temperature hikes, the quantity of radiations emitted
- Double increase
  - Double decrease
  - Increases**
  - Decreases
- 942) Consider a 20-cm-diameter spherical ball at 620 F suspended in air. Assuming the ball closely approximates a blackbody, determine the total blackbody emissive power in W/m<sup>2</sup> is.
- 8.37
  - 8378**
  - 9.37
  - 9378
- 943) Radiosity becomes equal to the emissive power when follows \_\_\_\_\_
- Weins displacement
  - Black body radiation**
  - Planks law
  - Both A and C
- 944) Steady flow devices includes
- Turbines
  - Boilers
  - Heat exchangers
  - All of these**
- 945) Viscosity in a fluid is due to
- Cohesiveness**
  - Adhesiveness
  - Molecular forces
  - All of these
- 946) The temperature of a gas stream is to be measured by a thermocouple whose junction can be approximated as a 1.5-mm-diameter sphere, The properties of the junction are  $k = 45 \text{ W/m} \cdot ^\circ\text{C}$ ,  $\rho = 8500 \text{ kg/m}^3$ , and  $C_p = 220 \text{ J/kg} \cdot ^\circ\text{C}$ , and the convection heat transfer coefficient between the junction and the gas is  $h = 210 \text{ W/m}^2 \cdot ^\circ\text{C}$ . Determine how long it will take for the thermocouple to read 99 percent of the initial temperature difference.
- 8 sec
  - 10 sec
  - 12 sec
  - None of these**
- 947) Which of the following substances don't have free surfaces?
- Solids
  - Liquid
  - Gases**
  - All of these
- 948) A perfect black body is one which
- Absorbs heat radiations of all wavelengths**

- b) Transmit all the radiation
- c) Reflect all the heat radiations
- d) None of these

949) The thickness of thermal and hydrodynamic boundary layer is equal if Prandtl number is

- a) Equal to Nusselt number
- b) Greater than one
- c) Equal to one**
- d) Less than one

950) The heat transfer takes place according to

- a) First law of thermodynamics
- b) 2nd law of thermodynamics**
- c) Third law of thermodynamics
- d) Kirchhoff law

951) Consider a 5-m-high, 5-m-wide, and 0.3-m-thick wall whose thermal conductivity is  $k = 0.5 \text{ W/m} \cdot ^\circ\text{C}$ . On a certain day, the temperatures of the inner and the outer surfaces of the wall are measured to be  $70^\circ\text{C}$  and  $32^\circ\text{C}$ , respectively. Determine the rate of heat loss through the wall on that day.

- a) 1.5 KW**
- b) 2 KW
- c) 3 KW
- d) None of these

952) 1.2 kg of liquid water initially at  $15^\circ\text{C}$  is to be heated to  $95^\circ\text{C}$  in a teapot equipped with a 1200-W electric heating element inside (Fig. 1–18). The teapot is 0.5 kg and has an average specific heat of  $0.7 \text{ kJ/kg} \cdot ^\circ\text{C}$ . Taking the specific heat of water to be  $4.18 \text{ kJ/kg} \cdot ^\circ\text{C}$  and disregarding any heat loss from the teapot, determine how long it will take for the water to be heated.

- a) 358 seconds**
- b) 355 seconds
- c) 360 SECONDS
- d) NONE OF THESE

953) Consider a person standing in a room maintained at  $22^\circ\text{C}$  at all times. The inner surfaces of the walls, floors, and the ceiling of the house are observed to be at an average temperature of  $10^\circ\text{C}$  in winter and  $25^\circ\text{C}$  in summer. Determine the rate of radiation heat transfer between this person and the surrounding surfaces for winter only if the exposed surface area and the average outer surface temperature of the person are  $1.4 \text{ m}^2$  and  $30^\circ\text{C}$ , respectively. (The emissivity of a person is 0.95)

- a) 40.9 W
- b) 152 W**
- c) 120 W
- d) None of these

954) Heat conducted through unit area and unit thick face per unit time when temperature difference between opposite faces is unity, is called

- a) Thermal resistance
- b) Thermal coefficient

- c) Temperature gradient
- d) **Thermal conductivity**

955) A 2000 W resistance heater wire whose thermal conductivity is  $k = 15 \text{ W/m}\cdot\text{°C}$  has a diameter of  $D = 4 \text{ mm}$  and a length of  $L = 0.5 \text{ m}$  and is used to boil water. If the outer surface temperature of the resistance wire is  $T_s = 105\text{°C}$ , determine the temperature at the center of the wire.

- a) 132C
- b) 120C
- c) 115C
- d) **126C**

956) The sum of all microscopic forms of energy is called the ----- of a system

- a) Macroscopic energy
- b) System energy
- c) **Internal energy**
- d) Specific heat

957) The rate at which energy is released per unit area ( $\text{W/m}^2$ ) is termed the surface emissive power

- a) Radiative power
- b) **Emissive power**
- c) Internal energy
- d) Cooking power

958) 1.2 kg of liquid water initially at  $15\text{°C}$  is to be heated to  $95\text{°C}$  in a teapot equipped with a 1200-W electric heating element inside (Fig. 1–18). The teapot is 0.5 kg and has an average specific heat of  $0.7 \text{ kJ/kg}\cdot\text{°C}$ . Taking the specific heat of water to be  $4.18 \text{ kJ/kg}\cdot\text{°C}$  and disregarding any heat loss from the teapot, determine how long it will take for the water to be heated.

- a) **358 seconds**
- b) 355 seconds
- c) 360 seconds
- d) None of these

959) Energy required to raise the temperature of a unit mass of a substance by one degree is known as....

- a) Latent heat
- b) Microscopic energy
- c) Enthalpy
- d) **Specific heat**

960) Consider a person standing in a room maintained at  $22\text{°C}$  at all times. The inner surfaces of the walls, floors, and the ceiling of the house are observed to be at an average temperature of  $10\text{°C}$  in winter and  $25\text{°C}$  in summer. Determine the rate of radiation heat transfer between this person and the surrounding surfaces for winter only if the exposed surface area and the average outer surface temperature of the person are  $1.4 \text{ m}^2$  and  $30\text{°C}$ , respectively. (The emissivity of a person is 0.95)

- a) 40.9 W
- b) **152 W**

- c) 120 W
- d) None of these

961) The portion of the internal energy of a system associated with the kinetic energy of the molecules is called ----- .

- a) **Sensible energy**
- b) Latent heat
- c) Specific heat
- d) Thermal energy

962) The resistance wire of a 1200-W hair dryer is 80 cm long and has a diameter of  $D = 0.3$  cm. Determine the rate of heat generation in the wire per unit volume, in  $W/cm^3$ , and the heat flux on the outer surface of the wire as a result of this heat generation.

- a) None of these
- b)  $202 W/cm^3$  &  $12 W/cm^2$
- c)  **$212 W/cm^3$  &  $15.9 W/cm^2$**
- d) All of these

963) The convection heat transfer mode is comprised of two mechanisms

- a) **Conduction and advection**
- b) Radiation and fluidity
- c) Thermal conductivity and diffusivity
- d) Conduction and convection

964) A subject that deals with equilibrium states and changes from one equilibrium state to another

- a) Heat transfer
- b) Mass transfer
- c) **Thermodynamics**
- d) Physics

965) Heat conducted through unit area and unit thick face per unit time when temperature difference between opposite faces is unity, is called

- a) Thermal resistance
- b) Thermal coefficient
- c) Temperature gradient
- d) **Thermal conductivity**

966) A material with high diffusivity will attain thermal equilibrium -----than materials with low thermal diffusivity.

- a) Two times faster
- b) Slowly
- c) **Faster**
- d) Smoothly

967) The concept of overall coefficient of heat transfer is used in heat transfer problems of

- a) Conduction
- b) Convection
- c) Radiation
- d) **Conduction and convection**



- 968) Up to the critical radius of insulation,
- Added insulation will increase heat loss**
  - Added insulation will decrease heat loss
  - Convective heat loss will be less than conductive heat loss
  - Heat flux will decrease
- 969) The process of heat transfer from one particle of the fluid to another by the actual movement of the fluid particles caused by some mechanical means, is known as
- Conduction
  - Free convection
  - Forced convection**
  - Radiation
- 970) Thermal diffusivity corresponds to which state of heat transfer
- Unsteady state**
  - Steady state
  - Transient state
  - None of these
- 971) The critical radius is the insulation radius at which the resistance to heat flow is
- Maximum
  - Zero
  - Minimum**
  - Doubled
- 972) A 2000 W resistance heater wire whose thermal conductivity is  $k = 15 \text{ W/m}\cdot\text{°C}$  has a diameter of  $D = 4 \text{ mm}$  and a length of  $L = 0.5 \text{ m}$  and is used to boil water. If the outer surface temperature of the resistance wire is  $T_s = 105\text{°C}$ , determine the temperature at the center of the wire.
- $132\text{°C}$
  - $120\text{°C}$
  - $115\text{°C}$
  - $126\text{°C}$**
- 973) An energy interaction is heat transfer if its driving force is a temperature difference, otherwise, it is
- Work**
  - Power
  - Enthalpy
  - Diffusion
- 974) Determine the steady state rate of heat transfer per unit area through a 4.0 cm thick homogeneous slab with its two faces maintained at uniform temperatures of  $38\text{°C}$  and  $21\text{°C}$ . The thermal conductivity of the material is  $0.19 \text{ W/m}\cdot\text{K}$ .
- $80.75 \text{ W/m}^2$**
  - $61.43 \text{ W/m}^2$
  - $32.54 \text{ W/m}^2$
  - $0.032 \text{ kW/m}^2$

975) The forced convective heat transfer coefficient for a hot fluid flowing over a cool surface is  $225 \text{ W/m}^2 \cdot ^\circ\text{C}$  for a particular problem. The fluid temperature upstream of the cool surface is  $120^\circ\text{C}$ , and the surface is held at  $10^\circ\text{C}$ . Determine the heat transfer rate per unit surface area from the fluid to the surface.

- a)  $20243 \text{ W/m}^2$
- b)  $32150 \text{ W/m}^2$
- c)  **$24750 \text{ W/m}^2$**
- d)  $35100 \text{ W/m}^2$

976) The rate of heat transfer between a solid surface and a fluid per unit surface area per unit temperature difference is termed as

- a) **Convection heat transfer coefficient**
- b) Conduction heat transfer coefficient
- c) Overall heat transfer coefficient
- d) Heat transfer per unit area

977) The radiation emitted by bodies at room temperature falls into the -----of the spectrum

- a) Ultraviolet region
- b) Thermal region
- c) Electromagnetics region
- d) **Infrared region**

978) The ratio of the radiation emitted by the surface at a given temperature to the radiation emitted by a blackbody at the same temperature.

- a) Black body radiation
- b) **Emissivity**
- c) Absorptivity
- d) Plank number

979) The cooling of an apple in a refrigerator is an example of

- a) **Transient heat transfer process**
- b) Steady heat transfer process
- c) Lumped system
- d) Newton law of cooling

980) A lecture room in department of Physics UAF has a 1.2-m-high and 2-m-wide glass window whose thickness is 6 mm and thermal conductivity is  $k = 0.78 \text{ W/m} \cdot ^\circ\text{C}$ . The temperature of its inner surface for a day during which the room is maintained at  $24^\circ\text{C}$  while the temperature of the outdoors is  $-5^\circ\text{C}$ . Take the convection heat transfer coefficients on the inner and outer surfaces of the window to be  $h_1 = 10 \text{ W/m}^2 \cdot ^\circ\text{C}$  and  $h_2 = 25 \text{ W/m}^2 \cdot ^\circ\text{C}$ , and disregard any heat transfer by radiation.

The steady rate of heat transfer through window glass is then

- (a) **471 W**
- (b) 472 W
- (c) 473 W
- (d) 474 W

981) A lecture room in department of Physics UAF has a 1.2-m-high and 2-m-wide glass window whose thickness is 6 mm and thermal conductivity is  $k = 0.78 \text{ W/m} \cdot ^\circ\text{C}$ . The temperature of its inner surface for a day during which the room is maintained at  $24^\circ\text{C}$  while

the temperature of the outdoors is  $-5^{\circ}\text{C}$ . Take the convection heat transfer coefficients on the inner and outer surfaces of the window to be  $h_1 = 10 \text{ W/m}^2 \cdot ^{\circ}\text{C}$  and  $h_2 = 25 \text{ W/m}^2 \cdot ^{\circ}\text{C}$ , and disregard any heat transfer by radiation.

The inner surface temperature of the window glass is

- (a)  **$4.4^{\circ}\text{C}$**
- (b)  $4^{\circ}\text{C}$
- (c)  $4.8^{\circ}\text{C}$
- (d)  $4.1^{\circ}\text{C}$

982) According to Stefan Boltzmann law, ideal radiators emit radiant energy at a rate proportional to

- a) Absolute temperature
- b) Square of temperature
- c) Fourth power of absolute temperature**
- d) Fourth power of temperature

983) Consider a student of Physics department standing in a class room maintained at  $20^{\circ}\text{C}$  at all times. The inner surfaces of the walls, floors, and ceiling of the house are observed to be at an average temperature of  $12^{\circ}\text{C}$  in winter and  $23^{\circ}\text{C}$  in summer. Determine the rates of radiation heat transfer between this student and the surrounding surfaces in both summer and winter if the exposed surface area, emissivity, and the average outer surface temperature of the person are  $1.6 \text{ m}^2$ ,  $0.95$ , and  $32^{\circ}\text{C}$ , respectively.

Heat transfer in summer is

- (a)  $78 \text{ W}$
- (b)  $84.2 \text{ W}$**
- (c)  $89 \text{ W}$
- (d)  $78.2 \text{ W}$

984) Up to the critical radius of insulation,

- a) Added insulation will increase heat loss**
- b) Added insulation will decrease heat loss
- c) Convective heat loss will be less than conductive heat loss
- d) Heat flux will decrease

985) The rate of energy transferred by convection to that by conduction is called

- a) Stanton number
- b) Nusselt number**
- c) Biot number
- d) Peclet number

986) A designer chooses the values of fluid flow rates and specific heats in such a manner that the heat capacities of the two fluids are equal. A hot fluid enters the counter flow heat exchanger at  $100^{\circ}\text{C}$  and leaves at  $60^{\circ}\text{C}$ . A cold fluid enters the heat exchanger at  $40^{\circ}\text{C}$ . The mean temperature difference between the two fluids is

- a)  $20^{\circ}\text{C}$**
- b)  $40^{\circ}\text{C}$

- c) 60°C
- d) 66.7°C

987) The process of heat transfer from one particle of the fluid to another by the actual movement of the fluid particles caused by some mechanical means, is known as

- a) Conduction
- b) Free convection
- c) Forced convection**
- d) Radiation

988) Oxygen bomb calorimeter measure .....

- a) Chemical change
- b) Physical change**
- c) Biological change
- d) All of these

989) Temperature is a ..... function

- a) Monotonic**
- b) Diatonic
- c) None of these
- d) All of these

990) Technique used to measure change in dimension of any material is

- a) Thermal expansion
- b) Dilatometry
- c) Strain
- d) All of these**

991) The function of primary reflector is

- a) To receive energy from the sun
- b) Divert energy toward secondary
- c) None of these
- d) All of these**

992) Which of the following is a disadvantage of most of the renewable energy sources?

- a) Highly polluting
- b) Unreliable supply**
- c) High waste disposal cost
- d) High running cost

993) Conductance is reciprocal of

- a) Reluctance
- b) Inductance
- c) Capacitance
- d) Resistance**

994) Horizontal axis and vertical axis are the types of

- a) Nuclear reactor
- b) Windmills**
- c) High waste disposal cost
- d) Biogas reactor

995) Which quantity consists of a unit 1 kWh?

- a) Energy**

- b) Time
  - c) Power
  - d) Charge
- 996) Reynolds number is the ratio of inertial force over
- a) Gravitational force
  - b) Viscous force**
  - c) Inertial
  - d) Bouncy force
- 997) Helium is produced on commercial scale from
- a) Air
  - b) Coke oven gas
  - c) Hydrogen
  - d) Natural gas**
- 998) Electric flux inside a conducting sphere is
- a) Uniform
  - b) Zero**
  - c) Undefined
  - d) Maximum
- 999) The resistance of a conductor varies inversely as
- a) Length
  - b) Area of cross section**
  - c) Resistivity
  - d) Temperature
- 1000) Power factor of the following will be zero
- a) Resistance
  - b) Inductance
  - c) Capacitance
  - d) None of these**
- 1001) The geometric concentration ratio of a conventional paraboloidal concentrator having one meter diameter and absorber diameter is 0.1 m will be
- a) 10
  - b)  $\pi$
  - c)  $2\pi$
  - d) 100**
- 1002) In n-type material, .... ..... can be used for doping
- a) Phosphorous, Boron, Antimony
  - b) Phosphorous, Antimony, Aluminum
  - c) Boron, Indium, Gallium
  - d) Bismuth, Arsenic, Antimony**
- 1003) Biodiesel is not recommended to be produced from
- a) Microalgae
  - b) Oil rich energy crops
  - c) Food crops**
  - d) Used cooking oil
- 1004) For a tube collector, the fraction of the incident solar radiation energy on the glass cover which is transferred to a heat transfer fluid as thermal energy inside the absorber tube is

- a) Thermal efficiency
  - b) **optical efficiency**
  - c) optical losses
  - d) none of these
- 1005) BTU is measurement of
- a) Volume
  - b) Area
  - c) **Heat content**
  - d) Temperature
- 1006) The angular location of north or south of the equator ranging from -90 to +90 degree is called
- a) Longitude
  - b) **Latitude**
  - c) Declination
  - d) Slope
- 1007) Acquiring management and leadership skills are \_\_\_\_\_ for a Professional Engineer
- a) Wastage of time
  - b) Not important
  - c) **Highly important**
  - d) Not necessary
- 1008) The conversion of organic material directly to a gas, termed as biogas is due to
- a) Pyrolysis
  - b) **Anaerobic digestion**
  - c) Fermentation
  - d) Combustion
- 1009) What type of energy is derived from heated groundwater?
- a) solar energy
  - b) **geothermal energy**
  - c) hydroelectric energy
  - d) nuclear energy
- 1010) The Pyranometer measures
- a) Direct Radiation
  - b) Diffusion Radiation
  - c) **Both A and B**
  - d) None of these
- 1011) Production of bioethanol is through fermentation of \_\_\_\_\_ and starch components
- a) alcohol
  - b) **sugar**
  - c) acid
  - d) milk

- 1012) The unit of inductance is
- a) **Henry**
  - b) Volts
  - c) Farad
  - d) Ampere
- 1013) Thermal conductivity of water \_\_\_\_\_ with rise in temperature
- a) Remains same
  - b) decreases
  - c) increases
  - d) **may increase or decrease depending on the temperature**
- 1014) For the smooth running of grid-tied system
- a) Battery bank should be compatible with load
  - b) Charge controller should be 1.2 times greater
  - c) **Utility grid should never be off**
  - d) All of these
- 1015) The source of geothermal energy is
- a) decay of radioactive element in the earth
  - b) compression of material in the earth
  - c) residual lost of the earth
  - d) **all as said in A – B and C**
- 1016) Common energy source in Pakistani villages is
- a) Electricity
  - b) Coal
  - c) **Wood and animal dung**
  - d) Sun