

1) What method of energy transfer requires no medium for transfer.

- A. Radiation
- B. Conduction
- C. Convection
- D. Advection

ANSWER: A

2) Emissivity of perfectly black body is

- A. 1
- B. 2
- C. 5
- D. 0

ANSWER: A

3) Absorptive power of perfectly black body is

- A. Zero
- B. Infinity
- C. One
- D. None of the above

ANSWER: C

4) Coefficient of reflection, absorption and transmission are related by

- A. $a+r+t=1$
- B. $a+r-t=1$
- C. $a+t=r$
- D. None of the above

ANSWER: A

5) Stefan Boltzmann Law is applicable for

- A. White Body
- B. Gray Body
- C. Black Body
- D. All the types of bodies

ANSWER: C

6) Which of the following is/are example/s of pool boiling?

- A. Completely submerged electrically heated coil in pool of liquid.
- B. Boiling of liquid in a kettle placed on stove.
- C. Both A & B
- D. None of the above.

ANSWER: C

7) In pool boiling, as soon as the temperature of heating surface reaches boiling point of liquid, heat transfer takes place by.....

- A. Conduction
- B. Natural convection
- C. Forced convection
- d. None of the above

ANSWER: B

8) When formation of bubbles becomes very high in pool boiling, then heat flux

- A. Rises
- B. Reduces
- C. Remains constant
- D. None of the above.

ANSWER: B

9) Which of the following is not a type of condensation heat transfer process?

- A. Dropwise
- B. Filmwise
- C. Bulkwise
- D. None of the above

ANSWER: C

10) Which surface does the dropwise condensation occur on?

- A. Wettable
- B. Non Wettable
- C. Both A and B
- d. None of the above

ANSWER: B

11) What method of energy transfer requires no medium for transfer.

- A. Radiation

- B. Conduction
- C. Convection
- D. Advection

ANSWER: A

12) In general good absorbers of electromagnetic radiation are also good.....

- A. Radiators.
- B. Reflectors.
- C. Refractors.
- D. Convectors.

ANSWER: A

13) Emissivity of perfectly black body is

- A. 1
- B. 2
- C. 5
- D. 0

ANSWER: A

14) Absorptive power of perfectly black body is

- A. Zero
- B. Infinity
- C. One
- D. None of the above

ANSWER: C

15) Shortest center to center distance between adjacent tubes is known as

- A. Tube pitch
- B. Tube clearance
- C. Tube distance
- D. None of the above

ANSWER: A

16) Center to center distance between adjacent baffles is known as

- A. Baffle spacing
- B. Baffle pitch

- C. Both A & B
 - D. None of the above
- ANSWER: C

17) Coefficient of reflection, absorption and transmission are related by

- A. $a+r+t=1$
- B. $a+r-t=1$
- C. $a+t=r$
- D. None of the above

ANSWER: A

18) The wavelength of maximum energy released during an atomic explosion was 2.93×10^{-10} m. Maximum temperature attained must be, if Wien's constant is 2.93×10^{-3} mK. (1 Mark)

- A. 5.86×10^7 K
- B. 10^{-13} K
- C. 10^{-7} K
- D. 10^7 K

ANSWER: D

19) Stefan Boltzmann Law is applicable for

- A. White Body
- B. Gray Body
- C. Black Body
- D. All the types of bodies

ANSWER: C

20) External cleaning of tubes is easier in

- A. Square pitch.
- B. Triangular pitch
- C. Both A & B
- D. None of the above

ANSWER: A

21) Heat transfer coefficients are relatively low in

- A. Single pass S & T HE
- B. Multiple pass S & T HE

- C. Both A & B
- D. None of the above.

ANSWER: A

22)When formation of bubbles becomes very high in pool boiling, then heat flux

- A. Rises
- B. Reduces
- C. Remains constant
- D. None of the above.

ANSWER: B

23)BWG stands for

- A. Birmingham wire guage
- B. Billion wire guage
- C. Both A & B
- D. None of the above

ANSWER: A

24)Which surface does the dropwise condensation occur on?

- A. Wettable
- B. Non Wettable
- C. Both A and B
- d. None of the above

ANSWER: B

25)Film condensation occurs on surface when.....

- A. Condensate can wet all the surface
- B. Condensate cannot wet surface.
- C. Both A & B
- D. None of the above.

ANSWER: A.

26)Surface coating is suitable to maintain

- A. Dropwise condensation
- B. Filmwise condensation
- C. Both A & B

D. None of the above.

ANSWER: A

27) Calculate the heat loss by radiation from an unlagged horizontal steam pipe, 50 mm O.D. at 377 K to air at 283 K, if $e = 0.90$.

A. 703.52 W/M²

B. 723.52 W/M²

C. 733.52 W/M²

D. None of the above.

ANSWER: A

28) What method of energy transfer requires no medium for transfer.

A. Radiation

B. Conduction

C. Convection

D. Advection

ANSWER: A

29) In general good absorbers of electromagnetic radiation are also good.....

A. Radiators.

B. Reflectors.

C. Refractors.

D. Convectors.

ANSWER: A

30) Emissivity of perfectly black body is

A. 1

B. 2

C. 5

D. 0

ANSWER: A

31) Absorptive power of perfectly black body is

A. Zero

B. Infinity

C. One

D. None of the above

ANSWER: C

32) Which of the following statement is wrong?

A. Rough surfaces are better radiators than smooth surfaces.

- B. Highly polished mirror surfaces are very good radiators.
- C. Black surfaces are better absorbers than white ones.
- D. Black surfaces are better radiators than white ones.

ANSWER: B

33) A metal piece is heated to T_1 K. The temperature of surrounding is T_2 K. The heat due to radiation is proportional to.....

- A. $(T_1^4 - T_2^4)$
- B. $(T_1 - T_2)^4$
- C. $(T_1^4 + T_2^4)$
- D. None of the above

ANSWER: A

34) Coefficient of reflection, absorption and transmission are related by

- A. $a+r+t=1$
- B. $a+r-t=1$
- C. $a+t=r$
- D. None of the above

ANSWER: A

35) The wavelength of maximum energy released during an atomic explosion was 2.93×10^{-10} m. Maximum temperature attained must be, if Wien's constant is 2.93×10^{-3} mK. (1 Mark)

- A. 5.86×10^7 K
- B. $10^{(-13)}$ K
- C. $10^{(-7)}$ K
- D. $10^{(7)}$ K

ANSWER: D

36) Stefan Boltzmann Law is applicable for

- A. White Body
- B. Gray Body
- C. Black Body
- D. All the types of bodies

ANSWER: C

37) Wien's Displacement law is given as

- A. $\lambda = C \times T$
- B. $\lambda = C / T$
- c. $\lambda \times T = C$
- D. $\lambda = T / C$

ANSWER: C

38) Which of the following is/are example/s of pool boiling?

- A. Completely submerged electrically heated coil in pool of liquid.
- B. Boiling of liquid in a kettle placed on stove.
- C. Both A & B
- D. None of the above.

ANSWER: C

39) In pool boiling, as soon as the temperature of heating surface reaches boiling point of liquid, heat transfer takes place by.....

- A. Conduction
- B. Natural convection
- C. Forced convection
- d. None of the above

ANSWER: B

40) When formation of bubbles becomes very high in pool boiling, then heat flux

- A. Rises
- B. Reduces
- C. Remains constant
- D. None of the above.

ANSWER: B

41) Which of the following is not a type of condensation heat transfer process?

- A. Dropwise
- B. Filmwise
- C. Bulkwise
- D. None of the above

ANSWER: C

42) Which surface does the dropwise condensation occur on?

- A. Wettable
- B. Non Wettable
- C. Both A and B
- d. None of the above

ANSWER: B

43) Film condensation occurs on surface when.....

- A. Condensate can wet all the surface
- B. Condensate cannot wet surface.
- C. Both A & B
- D. None of the above.

ANSWER: A.

44) Surface coating is suitable to maintain

- A. Dropwise condensation
- B. Filmwise condensation
- C. Both A & B
- D. None of the above.

ANSWER: A

45) Calculate the heat loss by radiation from an unlagged horizontal steam pipe, 50 mm O.D. at 377 K to air at 283 K, if $e = 0.90$.

- A. 703.52 W/M²
- B. 723.52 W/M²
- C. 733.52 W/M²
- D. None of the above.

ANSWER: A

46) Define: i) Conduction ii) Heat transfer coefficient

47) State Fourier's law.

48) Enlist parameters affecting thermal conductivity.

49) Give equation for heat flow through cylinder and write down the specification of every parameter included in the equation.

50) Give Sieder Tate equation with detailed specification.

51) Define: i) Chiller ii) Reboiler

52) Define tube pitch and draw the diagram.

53) Give advantages and disadvantages of the U tube heat exchanger

54) Give classification of transverse baffles.

55) Give Sieder Tate equation with detailed specification.

56) Derive an expression for heat flow through sphere.

57) Differentiate between concurrent and counter current flow.

58) Give classification of heat exchangers.

59) Explain in detail double pipe heat exchanger.

60) Draw the sketch of the shell & tube heat exchanger & explain various parts of it in detail.

61) A steam pipe 100 mm outside diameter is covered with two layers of insulating material, each 25 mm thick. The thermal conductivity of one being three times that of the other. Working from first principles show that the effectivity of the two layers is 15.7% less when the better insulating material is on the inside than when it is on the outside. Assume same overall temperature difference in both the cases.

62) Calculate the inside heat transfer coefficient for a fluid flowing at a rate of 300 cm³/s through a 20 mm inside diameter tube of a heat exchanger.

Data: Viscosity of flowing fluid = 0.8 (N.s)/m²

Density of flowing fluid = 1.1 g/cm³

Specific heat of fluid = 1.26 kJ/(kg.K)

Thermal conductivity of fluid = 0.384 W / (m.K)

Viscosity at wall temperature = 1.0 (N.s) / m²

Length of heat exchanger = 5 m

63) It is desired to heat 4450 kg/h of cold benzene from 27⁰C to 49⁰C using hot toluene which is cooled from 71⁰C to 38⁰C. The specific gravities are 0.88 and 0.87 respectively. A fouling factor of 1.60 X 10⁻⁴ (m²K)/W should be provided for each stream. A number of 6 m hairpins of 50 – by 31.75 mm IPS pipe are available. Find out area required.

Data: i.d. of inner pipe =: 35 mm

o.d. of inner pipe = 42 mm

i.d. Of outer pipe = 52.5 mm

For 31.75 mm IPS standard pipe there are 0.1326 m² of external surface per m length. Benzene flows through the inner pipe in counter-current fashion to toluene. Properties of benzene & toluene are as follows:

Property	Benzene	Toluene
Cp, kJ / (kg. K)	1.779	1.842
K, W / (m.K)	0.147	0.157
μ, kg / (m.s)	4.09X10 ⁻⁴	5.0X10 ⁻⁴