5 . Heat

Extra Questions

Answer the following

1) State the relation between the joule & the calorie

Ans – 1 calorie = 4.18 joules

2) State the relation between the joule & the kilocalorie

Ans – 1 kilocalorie = 4.18 $\times 10^3$ joules

3) Match the column 'A' & 'B' & write correct match

Column 'A'	Column 'B'
i) Relative Humidity	KJ/kg
ii) Specific heat capacity	Kg/ m^2
iii) Specific latent heat	Cal/$g^0\ C$
iv) Absolute humidity	%

Ans –

Column 'A'	Column 'B'
i) Relative Humidity	%
ii) Specific heat capacity	Cal/$g^0\ C$
iii) Specific latent heat	KJ/kg
iv) Absolute humidity	Kg/ m^2

4) Define latent heat of fusion

Ans – When a solid is converted into liquid at constant temperature (melting point of the substance) the amount of heat absorbed by it is called the latent heat of fusion

5) Define specific latent heat of fusion

Ans – The amount of heat energy absorbed at constant temperature by unit mass of a solid to convert into liquid phase is called the specific latent heat of fusion

6) Define boiling point of liquid

Ans – The constant temperature at which a liquid transform into gaseous state is called the boiling point of the liquid

7) What is meant by melting point of solid?

Ans – The constant temperature at which the solid converts into liquid state is called the melting point of the solid.

8) What is absolute humidity? what is its unit?

Ans – The mass of vapor present in a unit volume of air is called absolute humidity its unit is kg/m^3

9) Define specific heat capacity

Ans – The amount of heat energy required to raise the temperature of a unit mass of an object by 1^0C called the specific heat capacity of an object.

10) What is specific latent heat of vaporization?

Ans – The amount of heat energy absorbed at constant temperature by unit mass of a liquid to convert into gaseous phase is called the specific latent heat of vaporization.

11) Explain the term latent heat of vaporization

Ans – When a liquid is heated continuously initially, its temperature increases. Later, at a certain stage its temperature does not increase even when heat is supplied to it. At this temperature heat absorbed by the liquid is used for breaking the bonds between its atoms or molecules i.e. for doing work against the forces of attraction between the atoms or molecules & conversion into gaseous phase. This heat is called the latent heat of vaporization.

12. Write the correct match

Column 'A'	Column 'B'
Substance	Specific heat (cal/g^oc)
Water	0.54
Paraffin	0.11
Iron	0.095
Copper	1.0

Ans –

Substance	Specific heat (cal/g^oc)
Water	1.0
Paraffin	0.54
Iron	0.11
Copper	0.095

13. State the principle of heat exchange

Ans – If heat is exchanged between a hot & cold object & this system of two bodies is kept isolated from the environment such that no heat enters or leaves this system, then the principle of heat exchange is given as, heat energy lost by the hot object - Heat energy gained by the cold object.

14. What is regelation?

Ans – The phenomenon is which ice converts to liquid due to applied pressure & then reconverts to ice once the pressure is removed is called regelation.

15. What is humidity?

Ans – The moisture i.e. the presence of water vapor, in the atmosphere is called humidity.

16. What is the formula for % relative humidity?

Ans - % Relative Humidity =

$$\frac{\text{Actual mass of water vapor content in the air in a given volume}}{\text{Mass of vapor needed to make the air saturated in the volume}} \times 100$$

17. What is relative humidity?

Ans – The ratio of actual mass of water vapor content in the air for a given volume & temperature to that required to make the same volume of air saturated with water vapor at the same temperature is called the relative humidity.

18. What is absolute humidity? state its unit

Ans – The mass of water vapor present in a unit volume of air is called absolute humidity. Generally it is expressed in kg/m^3

19. Distinguish between heat & Temperature

Heat	Temperature
Heat is a form of energy which gives a sensation of warmth	Temperature is the degree of hotness or coldness of a body
Heat is obtained due to random motion of molecules in a substance.	Temperature is a quantity direction of flow of heat on keeping the two bodies in contact.
The SI unit of heat is joule (J)	The SI unit of temperature is Kelvin (k)
Heat is measured by the principle of calorimetry	Temperature is measured by a thermometer

20. What is dew point temperature?

Ans – If the temperature of unsaturated air is decreased, a temperature is reached at which the air becomes saturated with water vapor this temperature is called the dew point temperature.

21. What is the value of relative humidity at the dew point temperature?

Ans – At the dew point temperature, relative humidity is 100%

22. What is one cal heat?

Ans – The amount of heat necessary to raise the temperature of 1g of water by $1^o c$ from $14.5^o c \; to \; 15.5^o c$ is called one cal heat.

23. Give the application of regelation & explain it.
Ans – The phenomenon of regulation is used in the preparation of ice ball.

while preparing ice ball, first the small ice slab is shredded so that small piece of ice is formed. When the shredded ice is pressured around the tip of the stick, due to pressure applied the melting point of ice becomes lower than the $0^o c$ & it turns into water & as soon as the pressure is released it reconverts into ice, so the shredded ice converted into solid ice balls.

24. Conversion of heat energy to work is given by which law?

Ans – Conversion of heat energy to work is given by first law of thermodynamics.

25. How relative humidity is related to feeling humid or dry nature of the air?

Ans – The relative humidity at the dew point 100% If the relative humidity is more than 60%, we feel that the air is dry.

26. Why specific latent heat of fusion of ice is 80 cal/g

Ans – When 1g of ice at a pressure of once atmosphere & at a temperature $0^{o}c$ is converted into 1g of water,heat absorbed by the ice is 80 cal.

27. The specific latent heat of fusion of silver is 88.2 KJ/kg. explain why?

Ans – When 1 kg of silver at a pressure of one atmosphere & a temperature of $962^{0}c$ (melting point of silver) is converted info 1kg of silver in liquid phase, heat absorbed by the silver is 88.2KG

28. Why specific latent heat of vaporization of water is 540 cal/g

Ans – when 1g of water at a pressure of one atmosphere & at a temperature of $100^{0}c$ is converted into 1 g of steam , heat absorbed by the water is 540 cal

29. State whether the following statements are true or false

At dew point relative humidity is 100%

Ans – True

30. Specific latent heat of fusion is expressed in g/cal

Ans – False

Specific latent heat of fusion is expressed in cal/g

31. Specific heat capacity is expressed in cal/g^oc

Ans – True

32. Latent heat of fusion, Q = mL

Ans – True

33. 1kcal = 4.18 Joules

Ans – False

34. Equal heat is given to two objects A and B of mass 1 g . temperature of A increases by 3 ^{o}c and B by 5 ^{o}c . which object has more specific heat? And by what factor ?

Solution :- Data : m=1g, $\Delta T_1 = 3^oc, \Delta T_2 = 5^oc$

Q = $mc_1\Delta T_1 = mc_2\Delta T_2$

$$\frac{C1}{C2} = \frac{\Delta T_2}{\Delta T_1} = \frac{5^oc}{3^oc} = \frac{5}{3}$$

thus $C_1 > C_2$

the specific heat of A is more than that of B and $\frac{\text{specific heat of A}}{\text{specific heat of B}}$

35. When air is said to be saturated with water vapor?

Ans – When air contains maximum water vapor, it is said to be saturated with water vapor at that temperature.

36. When air said to be unsaturated with water vapor?

Ans – When air contains water vapor less than its capacity to hold water vapor at that temperature, it is said to be unsaturated with water vapor.

37. What is the unit of heat?

Ans – Unit of heat – Joule, erg, calorie, kilocalorie

38. Calculate the amount of heat required to convert 5g of ice of 0^oc into water at 0^oc (specific latent heat of fusion of ice = 80 cal/g)

Ans – Here, m = 5g, L = 80 cal/g Q = ?

Amount of heat required, Q = ML

= 5g × 80 cal/lg

= 400 calories

39. Find the amount of heat required to convert 10g of water at 100^oc into stream (specific latent heat of vaporization of water = 540 cal/g)

Ans – Here m = 10g, L = 540 cal/g Q =?

Amount of heat required Q= mL

= 10g × 540 cal/lg

= 5400 calories

40. Find the heat needed to raise the temperature of a silver container of mass 100g by $10^o c$ (c= 0.056 $cal/g^o c$)

Ans – Data: m = 100g, $\Delta T = 10^o c$ c = 0.056 cal/$g^o c$

Heat needed to raise the temperature of the container = mcΔT

= 100g × 0.056cal/$g^o c$ × $10^o c$

= 56 calories

41. Liquid ammonia is used in ice factory for making ice from water. If water at $20^o c$ is to be converted into 2 kg ice at $0^o c$ how many grams of ammonia are to be evaporated (Given = The latent heat of vaporization of ammonia = 341 cal/g)

Ans – Data: m = 2kg, $\Delta T = 20^o c - 0^o c = 20^o c$

c1 = 1 kcal/$kg^o c$, L1 (ice) = 80 kcal/kg

L2 (Vaporization of ammonia) = 341 cal/g= 341 kcal/kg, m_2 = ?

Q1 (heat lost by water) = M,C,T + M,L, = 2kg × 1kcal/$kg^o c$ × $20^o c + 2kg \times \frac{80kcal}{kg} = 40\ kcal + 160kal = 200\ kcal$

Q2 (heat absorbed by ammmonia) = $m_2 \times 341\ kcal/kg$

According to principle of heat exchange,

Q1 = Q2

$\therefore 200kcal = m_2 \times 341\ kcal/kg$

$\therefore m_2 = \frac{200}{341}\ kg = 0.5864\ kg = 586.49$

586.49 of ammonia are to be evaporated

42. State two effect of humidity present in atmosphere

Ans – Effect of humidity present in atmosphere when the temperature of air falls below the dew point, dew & fog are formed

43. Sates units of temperature

Ans – Units of temperature : °c , °F & k (kelvin)

44. What are the different ways of heat transfer ?

Ans – Heat is transferred by the modes of conduction, convection & radiation.

45. Complete the analogy:

Ans ……:melting point of ice :: 100^oC : Boling point of ice

Ans - 0^oC

46. SI :_____ : : CGS : cal/g

Ans – KJ/kg

47. Hot object : loss of energy : : cold object : ……..

Ans – gain of energy

48. _____ : water contracts : : 4^oC & above : water expands

Ans - $0^oC\ to\ 4^oC$

49. Define temperature

Ans – Temperature is used to measure the degree of hotness of a system.

50. Define the kilocalorie

Ans – The amount of heat necessary to raise the temperature of 1kg of water by 1^oC from $14.5^oC\ to\ 15.5^oC$ is called one kilocalone.