1. Heat required to convert one gram of ice at 0°*C* into steam at 100°*C* is (given L_{steam} = 536 *cal*/*gm*)

(a) 100 *calorie* (b) 0.01 *kilocalorie*

(c) 716 *calorie* (d) 1 *kilocalorie*

2. Work done in converting one gram of ice at –10°*C* into steam at 100°*C* is

(a) 3045 *J* (b) 6056 *J*

(c) 721 *J* (d) 616 *J*

3. Compared to a burn due to water at 100°*C*, a burn due to steam at 100°*C* is

(a) More dangerous (b) Less dangerous

(c) Equally dangerous (d) None of these

4. A beaker contains 200 *gm* of water. The heat capacity of the beaker is equal to that of 20 *gm* of water. The initial temperature of water in the beaker is 20°*C*. If 440 *gm* of hot water at 92°*C* is poured in it, the final temperature (neglecting radiation loss) will be nearest to

(a) 58°*C* (b) 68°*C*

(c) 73°*C* (d) 78°*C*

5. A liquid of mass *m* and specific heat *c* is heated to a temperature 2*T*. Another liquid of mass *m*/2 and specific heat 2*c* is heated to a temperature *T*. If these two liquids are mixed, the resulting temperature of the mixture is

(a) (2/3)*T* (b) (8/5)*T*

(c) (3/5)*T* (d) (3/2)*T*

6. If temperature scale is changed from °*C* to °*F*, the numerical value of specific heat will

(a) Increases (b) Decreased

(c) Remains unchanged (d) None of the above

7. A water fall is 84 *metres* high. If half of the potential energy of the falling water gets converted to heat, the rise in temperature of water will be

(a) 0.098°*C* (b) 0.98°*C*

(c) 9.8°*C* (d) 0.0098°*C*

8. In supplying 400 calories of heat to a system, the work done will be

(a) 400 *joules* (b) 1672 *joules*

(c) 1672 *watts* (d) 1672 *ergs*

9. The height of a waterfall is 84 *metre*. Assuming that the entire kinetic energy of falling water is converted into heat, the rise in temperature of the water will be

$(g = 9.8\ m/s^2,\ J = 4.2\ joule/cal)$

(a) 0.196°*C* (b) 1.960°*C*

(c) 0.96°*C* (d) 0.0196°*C*

10. Of two masses of 5 *kg* each falling from height of 10 *m*, by which 2*kg* water is stirred. The rise in temperature of water will be

(a) 2.6°*C* (b) 1.2°*C*

(c) $0.32°C$ (d) $0.12°C$

11. Water falls from a height of $210 m$. Assuming whole of energy due to fall is converted into heat the rise in temperature of water would be ($J = 4.3\ Joule/cal$)

(a) $42°C$ (b) $49°C$

(c) $0.49°C$ (d) $4.9°C$

12. A block of mass 100 *gm* slides on a rough horizontal surface. If the speed of the block decreases from 10 m/s to 5 m/s, the thermal energy developed in the process is

(a) 3.75 J (b) 37.5 J

(c) 0.375 J (d) 0.75 J

13. At $100°C$, the substance that causes the most severe burn, is

(a) Oil (b) Steam

(c) Water (d) Hot air

14. In a water-fall the water falls from a height of 100 m. If the entire K.E. of water is converted into heat, the rise in temperature of water will be

(a) $0.23°C$ (b) $0.46°C$

(c) $2.3°C$ (d) $0.023°C$

15. The temperature at which the vapour pressure of a liquid becomes equals to the external (atmospheric) pressure is its

(a) Melting point (b) Sublimation point

(c) Critical temperature (d) Boiling point

16. Calorimeters are made of which of the following

(a) Glass (b) Metal

(c) Wood (d) Either (a) or (c)

17. Triple point of water is

(a) $273.16°F$ (b) 273.16 K

(c) $273.16°C$ (d) 273.16 R

18. The amount of work, which can be obtained by supplying 200 *cal* of heat, is

(a) 840 *dyne* (b) 840 W

(c) 840 *erg* (d) 840 J

19. How many grams of a liquid of specific heat 0.2 at a temperature $40°C$ must be mixed with 100 *gm* of a liquid of specific heat of 0.5 at a temperature $20°C$, so that the final temperature of the mixture becomes $32°C$

(a) 175 *gm* (b) 300 g

(c) 295 *gm* (d) 375 g

20. 5 g of ice at $0°C$ is dropped in a beaker containing 20 g of water at $40°C$. The final temperature will be

(a) $32°C$ (b) $16°C$

(c) $8°C$ (d) $24°C$

21. One kilogram of ice at 0°C is mixed with one kilogram of water at 80°C. The final temperature of the mixture is

(Take : specific heat of water $= 4200\ J\,kg^{-1}\,K^{-1}$, latent heat of ice $= 336\ kJ\,kg^{-1}$)

(a) 40°C (b) 60°C

(c) 0°C (d) 50°C

22. Which of the following is the unit of specific heat

(a) $J\,kg\,°C^{-1}$ (b) $J/kg°C$

(c) $kg°C/J$ (d) $J/kg\,°C^{-2}$

23. 50 gm of ice at 0°C is mixed with 50 gm of water at 80°C, final temperature of mixture will be

(a) 0°C (b) 40°C

(c) 40°C (d) 4°C

24. A hammer of mass 1kg having speed of 50 m/s, hit a iron nail of mass 200 gm. If specific heat of iron is 0.105 $cal/gm°C$ and half the energy is converted into heat, the raise in temperature of nail is

(a) 7.1°C (b) 9.2°C

(c) 10.5°C (d) 12.1°C

25. 50 gm ice at 0°C in insulator vessel, 50g water of 100°C is mixed in it, then final temperature of the mixture is (neglect the heat loss)

(a) 10°C (b) $0° << T_m < 20°C$

(c) 20°C (d) Above 20°C

26. Calculate the amount of heat (in calories) required to convert 5 gm of ice at 0°C to steam at 100°C

(a) 3100 (b) 3200

(c) 3600 (d) 4200

27. 10 gm of ice at 0°C is mixed with 100 gm of water at 50°C. What is the resultant temperature of mixture

(a) 31.2°C (b) 32.8°C

(c) 36.7°C (d) 38.2°C

28. Boiling water is changing into steam. At this stage the specific heat of water is

(a) < 1 (b) ∞

(c) 1 (d) 0

29. The thermal capacity of a body is 80 cal, then its water equivalent is

(a) 80 cal/gm (b) 8 gm

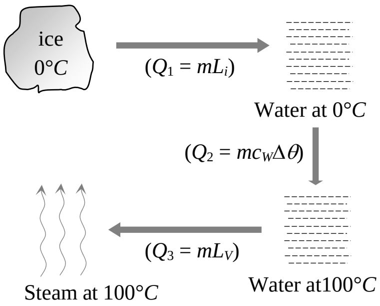
(c) 80 gm (d) 80 kg

30. Dry ice is

(a) Ice cube (b) Sodium chloride

(c) Liquid nitrogen (d) Solid carbon dioxide

1. (c) Conversion of ice ($0°C$) into steam ($100°C$) is as follows

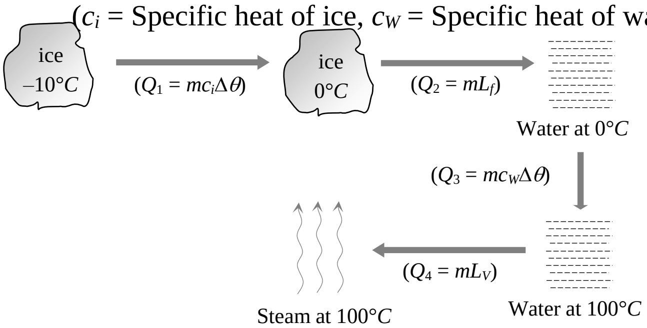


Heat required in the given process $= Q_1 + Q_2 + Q_3$

$= 1 \times 80 + 1 \times 1 \times (100 - 0) + 1 \times 536 = 716\ cal$

2. (a) Ice ($-10°C$) converts into steam as follows

(c_i = Specific heat of ice, c_W = Specific heat of water)



Total heat required $Q = Q_1 + Q_2 + Q_3 + Q_4$

$\Rightarrow Q = 1 \times 0.5(10) + 1 \times 80 + 1 \times 1 \times (100 - 0) + 1 \times 540$

$= 725\ cal$

Hence work done $W = JQ = 4.2 \times 725 = 3045\ J$

3. (a) Steam at $100°C$ contains extra 540 *calorie/gm* energy as compare to water at $100°C$. So it's more dangerous to burn with steam then water.

4. (b) Heat lost by hot water = Heat gained by cold water in beaker + Heat absorbed by beaker

$\Rightarrow 440(92 - \theta) = 200 \times (\theta - 20) + 20 \times (\theta - 20)$

$\Rightarrow \theta = 68°C$

5. (d) Temperature of mixture

$$\theta_{mix} = \frac{m_1c_1\theta_1 + m_2c_2\theta_2}{m_1c_1 + m_2c_2} = \frac{m \times c \times 2T + \frac{m}{2}(2c)T}{m.c + \frac{m}{2}(2c)} = \frac{3}{2}T$$

6. (b) $Q = m.c.\Delta\theta \Rightarrow c = \dfrac{Q}{m.\Delta\theta}$

In temperature measurement scale $\Delta\theta°F > \Delta\theta°C$ so $(c)_{°F} < (c)_{°C}$.

7. (a) As $W = JQ \Rightarrow \frac{1}{2}(mgh) = J \times mc\Delta\theta \Rightarrow \Delta\theta = \dfrac{gh}{2Jc}$

$\Delta\theta = \frac{9.8 \times 84}{2 \times 4.2 \times 1000} = 0.098\,°C$

$(\because c_{\text{water}} = 1000\ \frac{cal}{kg \times °C})$

Short trick : Remember the value of $\frac{g}{Jc_W} = 0.0023$, here $\Delta\theta = \frac{1}{2} \times (0.0023)h = \frac{1}{2} \times 0.0023 \times 84 = 0.098\,°C$

8. (b) $W = JQ = 4.18 \times 400 = 1672\ joule$

9. (a) $W = JQ \Rightarrow mg\,h = J(m.c.\Delta\theta)$

$\Rightarrow \Delta\theta = \frac{g\,h}{Jc} = 0.0023\ h = 0.0023 \times 84 = 0.196\,°C$

10. (d) $W = JQ \Rightarrow (2m)gh = J \times m'c\Delta\theta$

$\Rightarrow 2 \times 5 \times 10 \times 10 = 4.2(2 \times 1000 \times \Delta\theta)$

$\Rightarrow \Delta\theta = 0.1190\,°C = 0.12°C$

11. (c) $\Delta\theta = 0.0023\ h = 0.0023 \times 210 = 0.483\,°C \approx 0.49°C$.

12. (a) According to energy conservation, change in kinetic energy appears in the form of heat (thermal energy).

$\Rightarrow$ *i.e.* Thermal energy $= \frac{1}{2}m(v_1^2 - v_2^2)$ $\left[\because \underset{\text{(Joule)}}{W} = \underset{\text{(Joule)}}{Q}\right]$

$= \frac{1}{2}(100 \times 10^{-3})(10^2 - 5^2) = 3.75\ J$

13. (b) Among all the option, latent heat of steam is highest.

14. (a) $\Delta\theta = 0.0023\ h = 0.0023 \times 100 = 0.23°C$

15. (d) At boiling point, vapour pressure becomes equal to the external pressure.

16. (b) Calorimeters are made by conducting materials.

17. (b) Triple point of water is 273.16 *K*.

18. (d) $W = JQ \Rightarrow W = 4.2 \times 200 = 840\ J$.

19. (d) Temperature of mixture $\theta = \frac{m_1c_1\theta_1 + m_2c_2\theta_2}{m_1c_1 + m_2\theta_2}$

$\Rightarrow 32 = \frac{m_1 \times 0.2 \times 40 + 100 \times 0.5 \times 20}{m_1 \times 0.2 + 100 \times 0.5} \Rightarrow m_1 = 375\ gm$

20. (b) For water and ice mixing $\theta_{\text{mix}} = \frac{m_W\theta_W - \frac{m_iL_i}{c_W}}{m_i + m_W}$

$$= \frac{20 \times 40 - \frac{5 \times 80}{1}}{5 + 20} = 16\,°C$$

21. (c) $\theta_{\text{mix}} = \frac{m_W \theta_W - \frac{m_i L_i}{c_W}}{m_i + m_W}$

$\because m_i = m_W \Rightarrow \theta_{mix} = \frac{\theta_W - \frac{L_i}{c_W}}{2} = \frac{80 - \frac{336}{4.2}}{2} = 0°C$

22. (a) $c = \frac{Q}{m.\Delta\theta} \rightarrow \frac{J}{kg \times °C}$

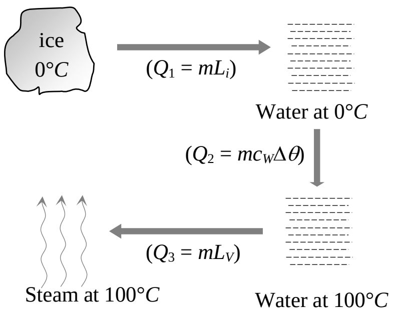
23. (a) $\theta_{\text{mix}} = \frac{\theta_W - \frac{L_i}{c_W}}{2} = \frac{80 - \frac{80}{1}}{2} = 0$

24. (a) $W = JQ \;\Rightarrow \frac{1}{2}\left(\frac{1}{2}Mv^2\right) = J(m.c.\Delta\theta)$

$\Rightarrow \frac{1}{4} \times 1 \times (50)^2 = 4.2[200 \times 0.105 \times \Delta\theta] \Rightarrow \Delta\theta = 7.1°C$

25. (a) $\theta_{\text{mix}} = \frac{\theta_W - \frac{L_i}{C_W}}{2} = \frac{100 - \frac{80}{1}}{2} = 10\,°C$

26. (c) Ice ($0°C$) converts into steam ($100°C$) in following three steps.



Total heat required $Q = Q_1 + Q_2 + Q_3$

$= 5 \times 80 + 5 \times 1 \times (100 - 0) + 5 \times 540 = 3600\ cal$

27. (d) $\theta_{\text{mix}} = \frac{m_W \theta_W - \frac{m_i L_i}{c_W}}{m_i + m_W} = \frac{100 \times 50 - 10 \times \frac{80}{1}}{10 + 100} \approx 38.2°C$

28. (b) $c = \frac{Q}{m.\Delta\theta}$; as $\Delta\theta = 0$, hence c becomes ∞.

29. (c) We know that thermal capacity of a body expressed in calories is equal to water equivalent of the body expressed in grams.

30. (d) We know that when solid carbondioxide is heated, it becomes vapour directly without passing through its liquid phase. Therefore it is called dry ice.