Exercise-1

ONLY ONE OPTION CORRECT TYPE

SECTION (A): CALORIMETRY

1. The amount of heat required to change the state of 1 kg of substance at constant temperature is called
(1) kilocal (2) calorie (3) specific heat (4) latent heat

2. The water equivalent of a 400 g copper calorimeter (specific heat = 0.1 cal/g^{o}C)
(1) 40 g (2) 4000 g (3) 200 g (4) 4 g

3. Heat required to convert 1 g of ice at 0^{o}C into steam at 100^{o}C is
(1) 100 cal (2) 0.01 cal/^{o}C (3) 720 cal (4) 1 kilocal

4. The thermal capacity of 40 g of aluminium (specific heat = 0.2 cal/gm^{o}C)
(1) 40 cal/^{o}C (2) 160 cal/^{o}C (3) 200 cal/^{o}C (4) 8 cal/^{o}C

5. The boiling water is changing into steam. Under this condition, the specific heat of water is
(1) zero (2) one (3) infinite (4) less than one

6. One kg of ice at 0^{o}C is mixed with 1 kg of water at 10^{o}C. The resulting temperature will be
(1) between 0^{o}C and 10^{o}C (2) 0^{o}C
(3) less than 0^{o}C (4) greater than 0^{o}C

7. If 10g of ice at 0^{o}C is mixed with 10g of water at 40^{o}C, the final mass of water in the mixture is
(1) 10 g (2) 15 g (3) 18 g (4) 20 g

8. Water is used to cool the radiators of engines in cars because : **[RPMT 2005]**
(1) of its low boiling point (2) of its high specific heat
(3) of its low density (4) of its easy availability

9. Steam at 100^{o}C is passed into 2.0 kg of water contained in a calorimeter of water equivalent 0.02 kg at 15^{o}C till the temperature of the calorimeter and its contents rise to 90^{o}C. The mass of steam condensed in kg is
(1) 0.301 (2) 0.280 (3) 0.60 (4) 0.02

10. A small quantity, mass m, of water at a temperature θ (in^{o}C) is poured on to a large mass M of ice which is at its melting point. If c is the specific heat capacity of water and L the latent heat of fusion of ice, then the mass of ice melted is given by :
(1) $\frac{ML}{mc\theta}$ (2) $\frac{mc\theta}{ML}$ (3) $\frac{Mc\theta}{L}$ (4) $\frac{mc\theta}{L}$

11. 20 gm ice at –10 ^{o}C is mixed with m gm steam at 100 ^{o}C. Minimum value of m so that finally all ice and steam converts into water. (Use s_{ice}=0.5 cal/gm^{o}C, s_{water}=1 cal/gm^{o}C,L (melting)=80 cal/gm and L (vaporization) = 540 cal/gm)
(1) $\frac{85}{32}$ gm (2) $\frac{85}{64}$ gm (3) $\frac{32}{85}$ gm (4) $\frac{64}{85}$ gm

12. 300 calories of heat is supplied to raise the temperature of 50 gm of air from 20°C to 30°C without any change in its volume. Change in internal energy per gram of air is **[RPMT 2011]**
(1) zero (2) 0.6 calories (3) 1.2 calories (4) 6.0 calories

13. How much heat energy is gained when 5 kg of water at 20°C is brought to its boiling point?
(Specific heat of water = 4.2 $kg^{-1}c^{-1}$)
(1) 1680 kJ (2) 1700 kJ (3) 1720 kJ (4) 1740 kJ

14. Two rigid boxes containing different ideal gases are placed on a table. Box A contains one mole of nitrogen at temperature T_0, While Box B contains one mole of helium at temperature (7/3) T_0. The boxes are then put into thermal contact with each other and heat flows between them until the gases reach a common final temperature (Ignore the heat capacity of boxes). Then, the final temperature of the gases, Tf, in term of T0 is **[AIIMS 2008]**

(1) $T_f = \frac{7}{3}T_0$ (2) $T_f = \frac{3}{2}T_0$ (3) $T_f = \frac{5}{2}T_0$ (4) $T_f = \frac{3}{7}T_0$

15. Compared to a burn due to water at 100°C, a burn due ot stem at 100°C is
(1) More dangerous (2) Less dangerous (3) Equally dangerous (4) None of these

16. There moment should have its heat capacity small. If P is mercury thermometer, Q is resistance thermomerter and R thermocouple type then
(1) P is best, R worst (2) R is best, P worst
(3) R is best, Q worst (4) P is best, Q worst

17. If 1g of steam is mixed with 1 g of ice, then the resultant temperature of the mixture is : **[AIPMT 1999]**
(1) 270°C (2) 230°C (3) 100°C (4) 50°C

18. The amount of heat required to convert gram of ice at 0ºC into steam at 100ºC will be - **[RPMT-1999]**
(1) 716 cal (2) 500 cal (3) 180 cal (4) 100 cal

19. 10 grams of ice at 0ºC is mixed with 10 grams of water at 20ºC. The final temperature of mixture will be- **[RPMT-1999]**
(1) 50ºC (2) 10ºC (3) 0ºC (4) 15ºC

20. The amount of heat required to change 1 gm (0ºC) of ice into water of 100°C, is : **[RPMT 1999]**
(1) 716 cal (2) 500 cal (3) 180 cal (4) 100 cal

21. Latent heat of steam is 536 cal/gm, then its value in joule/kg is: **[RPMT 1999]**
(1) $2.25 \times 10_6$ (2) $2.25 \times 10_3$ (3) 2.25 (4) none of these

22. At 100ºC, the substance that causes the most severe burn, is -
(1) Oil (2) Steam (3) Water (4) Hot air
[Karnataka CET (Engg. /Med.) 1993; UPSEAT-1999]

23. The SI unit of mechanical equivalent of heat is - **[MP PMT/PET-1998]**
(1) joule × calorie (2) joule/calorie (3) calorie×erg (4) erg/calorie

24. Volume expansion coefficient of a gas at constant presure equal to : **[RPMT 2001]**
(1) temperature
(2) proportional to square root of temperature
(3) inversely proportional to square root of temperature
(4) inversely proportional to temperature

25. 50 gm ice at 0ºC in insulator vessel, 50 g water of 100ºC is mixed in it, then final temperature of the mixture is (neglect the heat loss) : **[RPMT 2001]**
(1) 10ºC (2) $0º << T_m < 20ºC$ (3) 20ºC (4) Above 20ºC

26. A bottle is filled with water at 30ºC. When it is taken on the moon then : **[RPMT 2002]**
(1) water will freeze
(2) water will boil
(3) water will decompose in hydrogen and oxygen
(4) nothing will happen to water

27. Work done in converting one gram of ice at –10ºC into steam at 100ºC is -
[MP PET/PMT 1998 EAMCET (MED.) 1995; MP PMT-2002]
(1) 3045 J (2) 6056 J (3) 721 J (4) 616 J

28. The ratio of radii of two spheres of same material is 1 : 4, then the ratio of their heat capacities is

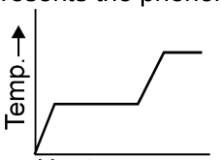
[RPMT 2003]

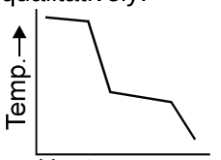
(1) $\frac{1}{4}$ (2) $\frac{1}{16}$ (3) $\frac{1}{32}$ (4) $\frac{1}{64}$

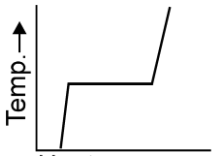
29. Heat given to a body which raises its temperature by 1°C is : **[AIEEE 2002, 3/300]**
(1) water equivalent (2) thermal capacity
(3) specific heat (4) temperature gradient 32453351

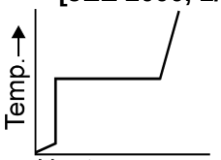
30. If mass – energy equivalence is taken into account, when water is cooled to form ice, in an isolated system the mass of water should: **[AIEEE 2002, 3/300]**
(1) increase (2) remain unchanged
(3) decrease (4) first increase then decrease

31. A block of ice at -10ºC is slowly heated and converted to steam at 100ºC. Which of the following curves represents the phenomenon qualitatively: **[JEE 2000, 1/35]**

(1) 

(2) 

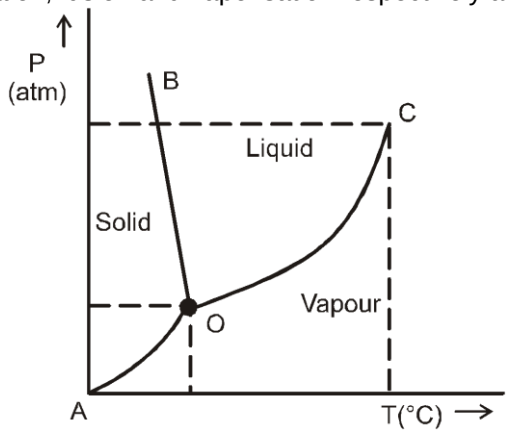
(3) 

(4) 

32. 540 g of ice at 0°C is mixed with 540g of water at 80°C. What is the final temperature of the mixture. **[RPMT 2010]**
(1) 0°C (2) 40°C (3) 80°C (4) 0°C

33. The thermal capacity of any body is : **[RPMT 2011]**
(1) a measure of its capacity of absorb heat
(2) a measure of its capacity to provide heat
(3) the quantity of heat required to raise its temperature by a unit degree
(4) the quantity of heat required to raise the temperature of a unit mass of the body by a unit degree

34. Figure shows the pressure - temperature phase diagram for water, the curves corresponding to sublimation, fusion and vaporisation respectively are **[RPMT-014]**



(1) AO, OB and OC (2) BO, OC and AO (3) OC, BO and AO (4) AO, OC and BO

35. An electric kettle takes 4A current at 220V. How much time will it take to boil 1 kg of water from temperature 20°C ? The temperature of boiling water is 100°C : **[AIPMT 2008]**
(1) 6.3 min (2) 8.4 min (3) 12.6 min (4) 4.2 min

36. Time taken by a 836 W heater to heat one liter of water from 10ºC to 40ºC is : **[AIEEE 2004, 3/300]**
(1) 50 s (2) 100 s (3) 150 s (4) 200 s

37. 2 liters water at 27°C is heated by a 1 kW heater in an open container. On an average heat is lost to surroundings at the rate 160 J/s. The time required for the temperature to reach 77°C is **[JEE-2005 (Scr.), 3/84, –1]**

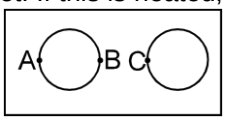
(1) 8 min 20 sec (2) 10 min (3) 7 min (4) 14 min

38. A piece of ice (heat capacity = 2100 J kg^{-1} $^oC^{-1}$ and latent heat = 3.36×10^5 J kg^{-1}) of mass m grams is at –5 ºC at atmospheric pressure. It is given 420 J of heat so that the ice starts melting. Finally when the ice-water mixture is in equilibrium, it is found that 1 gm of ice has melted. Assuming there is no other heat exchange in the process, the value of m is : **[JEE 2010, 3/163]**

(1) 8 gm (2) 5 gm (3) 6 gm (4) 10 gm

SECTION (B) : THERMAL EXPANSION

1. Two large holes are cut in a metal sheet. If this is heated, distances AB and BC, (as shown)



(1) both will increase (2) both will decrease
(3) AB increases, BC decreases (4) AB decreases, BC increases

2. A steel scale is to be prepared such that the millimeter intervals are to be accurate within 6×10^{-5} mm. The maximum temperature variation from the temperature of calibration during the reading of the millimeter marks is ($\alpha = 12 \times 10^{-6}$ k^{-1})

(1) 4.0°C (2) 4.5°C (3) 5.0°C (4) 5.5°C

3. Expansion during heating –

(1) occurs only in a solid (2) increases the density of the material
(3) decreases the density of the material (4) occurs at the same rate for all liquids and solids.

4. If a bimetallic strip is heated, it will .

(1) bend towards the metal with lower thermal expansion coefficient.
(2) bend towards the metal with higher thermal expansion coefficient.
(3) twist itself into helix.
(4) have no bending.

5. Two holes of unequal diameters d_1 and d_2($d_1 > d_2$) are cut in a metal sheet. If the sheet is heated-

(1) Both d_1 and d_2 will decrease (2) Both d_1 and d_2 will increase
(3) d_1 will increase d_2 will decrease (4) d_1 will dcrease, d_2 will increase

6. Two bars of copper having same length but unequal diameter are heated to the same temperature. The change in length will be -

(1) More in thinner bar
(2) More in thicker bar
(3) Same for both the bars
(4) Determined by the ratio of length and diameter of the bars

7. A metallic bar is heated from 0ºC to 100ºC. The coefficient of linear expansion is $10^{-5}K^{-1}$. What will be the percentage increase in length

(1) 0.01% (2) 0.1% (3) 1% (4) 10%

8. A pendulum clock has an iron pendulum 1m long ($\alpha_{iron} = 10^{-5}/^oC$). If the temperature rises by 10ºC, the clock-

(1) Will lose 8 seconds per day (2) Will lose 4.32 seconds per day
(3) Will gain 8 seconds per day (4) Will gain 4.32 seconds per day

9. Two rods of lengths ℓ_1 and ℓ_2 are made of materials whose coefficient of linear expansions are α_1 are α_2. If the difference between two lengths is independent of temperature -

(1) $\frac{\ell_1}{\ell_2} = \frac{\alpha_1}{\alpha_2}$ (2) $\frac{\ell_1}{\ell_2} = \frac{\alpha_2}{\alpha_1}$ (3) $\ell_{22}\alpha_1 = \ell_{12}\,\alpha_2$ (4) $\frac{\alpha_1^2}{\ell_1} = \frac{\alpha_2^2}{\ell_2}$

10. If α, β, γ are respectively the linear, superficial and cubical expansivity of a homogeneous solid, then -

(1) α : β : γ = 1 : 2 : 3 (2) α : β : γ = 3 : 2 : 1 (3) α : β : γ = 2 : 3 : 1 (4) α : β : γ = 3 : 1 : 3

11. The coefficient of linear expansion of steel and brass are 11×10^{-6}/ºC and 19×10^{-6}/ºC respectively. If their difference in lengths at all temperatures has to be kept constant at 30cm, their lengths at 0ºC should be –

(1) 71.25 cm and 41.25 cm (2) 82 cm and 52 cm
(3) 92 cm and 62 cm (4) 62.25 cm and 32.25 cm

12. A solid ball of metal has a spherical cavity inside it. If the ball is heated, the volume of the cavity will -

(1) Increase (2) Decrease
(3) Remains unchanged (4) Have its shape changed

13. If the length of a cylinder on heating increases by 2%, the area of its base will increase by-

(1) 0.5% (2) 2% (3) 1% (4) 4%

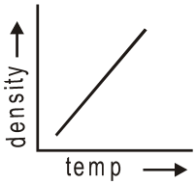
14. A uniform metal rod is used as a bar pendulum. If the room temperature rises by 10ºC, and the coefficient of linear expansion of the metal of the rod is 2×10^{-6}perºC, the period of the pendulum will have percentage increase of -

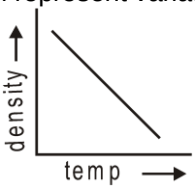
(1) -2×10^{-3} (2) -1×10^{-3} (3) 2×10^{-3} (4) 1×10^{-3}

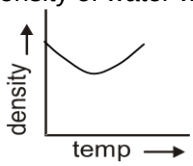
15. The volume of a solid decreases by 0.6% when it is cooled through 50ºC. Its coefficient of linear expansion is -

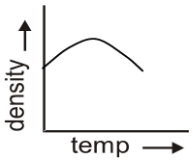
(1) 4×10^{-6}K (2) 5×10^{-5}K (3) 6×10^{4}K (4) 4×10^{-5}K

16. Which of the following graph represent variation of density of water with temperature best -

(1) 

(2) 

(3) 

(4) 

17. A rectangular block is heated from 0ºC to 100ºC. The percentage increase in its length is 0.10% What will be the percentage increase in it volume ?

(1) 0.03 % (2) 0.10% (3) 0.30% (4) none of these

18. A thin copper wire of length ℓ increases in lenth by 1% when heated from 0ºC to 100ºC. If a then cooper plate of area $2\ell \times \ell$ is heated from 0ºC to 100ºC, the percentage increase in its area will be

(1) 1% (2) 2% (3) 3% (4) 4%

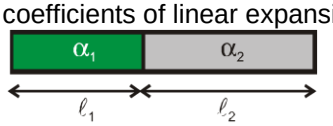
19. If I is the moment of inertia of a solid body having α -coefficient of linear expansion then the change in I corresponding to a small change in temperature ΔT is

(1) $\alpha I \Delta T$ (2) $\frac{1}{2} \alpha I \Delta T$ (3) $2 \alpha I \Delta T$ (4) $3 \alpha I \Delta T$

20. A liquid with coefficient of volume expansion γ is filled in a container of a material having the coefficient of linear expansion α .If the liquid overflows on heating, then.

(1) $\gamma > 3\alpha$ (2) $\gamma < 3\alpha$ (3) $\gamma = 3\alpha$ (4) none of these

21. Two rods having length ℓ_1 and ℓ_2, made of materials with the linear expansion coefficient α_1 and α_2, were soldered together. The equivalent coefficients of linear expansion for the obtained rod :-



(1) $\frac{\ell_1\alpha_2 + \ell_2\alpha_1}{\ell_1 + \ell_2}$ (2) $\frac{\alpha_1\alpha_2}{\alpha_1 + \alpha_2}$ (3) $\frac{\ell_1\alpha_1 + \ell_2\alpha_2}{\ell_1 + \ell_2}$ (4) $\frac{(\alpha_1 + \alpha_2)}{2}$

22. The volume thermal expansion coefficient of an ideal gas at constant pressure and temperature TK is

(1) T (2) T_2 (3) $\frac{1}{T}$ (4) $\frac{1}{T^2}$

23. A metallic ball and highly stretched spring are made of the same material and have the same mass. They are heated so that they melt, the latent heat required
(1) Are the same for both
(2) Is greater for the ball
(3) Is greater for the spring
(4) For the two may or may not be the same depending upon the metal

24. The coefficients of linear expansions of brass and steel are α_1 and α_2 respectively. When we take a brass rod of length ℓ_1 and a steel rod of length ℓ_2 at 0°C, then the difference in their lengths ($\ell_2 - \ell_1$) will remain the same at all temperatures if : **[AIPMT 1999]**
(1) $\alpha_1\ell_1 = \alpha_2\ell_2$ (2) $\alpha_1\ell_2 = \alpha_2\ell_1$ (3) $\alpha_{12}\ell_2 = \alpha_{22}\ell_1$ (4) $\alpha_1\ell_{22} = \alpha_2\ell_{12}$

25. If on heating liquid through 80ºC , the mass expelled is (1/100) th of mass still remaining, the coefficient of apparent expansion of liquid is : **[RPMT 2004]**
(1) 1.25×10^{-4}/ºC (2) 12.5×10^{-4}/ºC (3) 1.25×10^{-5}/ºC (4) none of these

26. An iron bar of length ℓ and having a cross-section A is heated from 0 to 100ºC. If this bar is so held that it is not permitted to expand or bend, the force that is developed, is : **[RPMT 2005]**
(1) inversely proportional to the cross-sectional area of the bar
(2) independent of the length of the bar
(3) inversely proportional to the length of the bar
(4) directly proportional to the length of the bar

27. If the sphere of iron is heated, then its **[RPMT 2009]**
(1) density increases (2) volume increases
(3) radius decreases (4) None of these

28. Two rods, one of aluminium of length ℓ_1 having coefficient of linear expansion α_a and other of steel is having coefficient of linear expansion α_s and length ℓ_2 are joined end to end . The expansion in both the rods is same for same variation of temperature. Then the value of $\frac{\ell_1}{\ell_1 + \ell_2}$ is **[JEE Scr.'2003, 3/84,–1]**
(1) $\frac{\alpha_s}{\alpha_a}$ (2) $\frac{\alpha_a}{\alpha_s}$ (3) $\frac{\alpha_s}{\alpha_a + \alpha_s}$ (4) $\frac{\alpha_a}{\alpha_a + \alpha_s}$

SECTION (C) : TEMPERATURE

1. A difference of temperature of 25º C is equivalent to a difference in farnehite :
(1) 45º F (2) 72º F (3) 32º F (4) 25º F

2. What is the temperature at which we get the same reading on both the centigrade and Fahrenheit scales?
(1) – 40ºC or – 40ºF (2) – 30ºC or – 30º F (3) – 30ºC or – 40ºF (4) – 10ºC or – 10ºF

3. Absolute temperature can be calculated from by
(1) Mean square velocity of molecules (2) Motion of the molecule
(3) Both (a) and (b) (4) None of the above

4. The absolute zero is the temperature at which
(1) Water freezes (2) All substances exist in solid state
(3) Molecular motion ceases (4) None of the above

5. Absolute zero (0K) is that temperature at which
(1) Matter ceases to exist (2) Ice melts and water freezes
(3) Volume and pressure of a gas becomes zero (4) None to these

6. The temperature on Celsius scale is 25°C. What is the corresponding temperature on the Fahrenheit scale
(1) 40°F (2) 77°F (3) 50°F (4) 45°F

7. Two thermometers are used to record the temperature of a room. If the bulb of one is wrapped in wet hanky
(1) The temperature recorded by both will be same
(2) The temperature recorded by wet-bulb thermometer will be greater than that recorded by the other
(3) The temperature recorded by dry-bulb thermometer will be greater than that recorded by the other
(4) None of the above

8. A centigrade and a Fahrenheit thermometer are dipped in boiling water. The water temperature is lowered until the Fahrenheit thermometer registers 140°F. What is the fall in temperature as registered by the Centigrade thermometer
(1) 30° (2) 40° (3) 60° (4) 80°

9. A 5°C rise in temperature is observed in a conductor by passing a current. When the current is doubled the rise in temperature will be approximately : **[AIPMT1998]**
(1) 16°C (2) 10°C (3) 20°C (4) 12°C

10. Value of – 40ºC in Fahrenheit scale is : **[RPMT 1999]**
(1) –40º F (2) 32°F (3) –32ºF (4) 40ºC

11. If temperature of an object is 140º F, then its temperature in centrigrade is : **[RPMT 1999]**
(1) 105ºC (2) 32ºC (3) 140°C (4) 60ºC

12. The colour of a star indicates its : **[RPMT 2005]**
(1) temperature (2) distance (3) velocity (4) size

13. The temperature of a body on kelvin scale is found to be x K. When it is measured by Fahrenheit thermometer, it is found to be x°F, then the value of x is : **[RPMT 2009]**
(1) 30 (2) 313 (3) 574.25 (4) 301.25

14. A constant pressure thermometer when immersed in ice cooled water gives volume reading 47.5 unit and when immersed in boiling liquid, it gives reading of 67 unit. What is the boiling point of the liquid. **[RPMT 2010]**
(1) 135°C (2) 125°C (3) 112°C (4) 100°C

15. A beaker is completely filled with water at 4°C. The water will overflow if it is : **[RPMT 2010]**
(1) Warmed to temperature greater than 4°C (2) Cooled to temperature less than 4°C
(3) (1) and (2) both (4) None of the above

16. On a new scale of temperature (which is linear) and called the W scale, the freezing and boiling points of water are 39°W and 239°W respectively. What will be the temperature on the new scale, corresponding to a temperature of 39°C on the Celsius scale ? **[AIPMT2008]**
(1) 78°C (2) 117°W (3) 200°W (4) 139°W

Exercise-2

ONLY ONE OPTION CORRECT TYPE

1. A thermally isolated vessel contains 100 g of water at 0ºC. When air above the water is pumped out, some of the water freezes and some evaporates at 0ºC itself. Then the mass of the ice formed if no water is left in the vessel. Latent heat of vaporization of water at 0ºC = $2.10 \times 10_6$ J/kg and latent heat of fusion of ice = $3.36 \times 10_5$ J/kg.
(1) 86.2 g (2) 13.8 g (3) 76.2 g (4) 65.6 g

2. 2 kg ice at – 20 ºC is mixed with 5 kg water at 20 ºC. Then final amount of water in the mixture would be : Given : specific heat of ice = 0.5 cal/g ºC, specific heat of water = 1 cal/g ºC, latent heat of fusion of ice = 80 cal/gm] **[JEE Scr. '2003, 3/84]**
(1) 6 kg (2) 7 kg (3) 3.5 kg (4) 5 kg

3. In an insulated vessel, 0.05 kg steam at 373 K and 0.45 kg of ice at 253 K are mixed. Find the final temperature of the mixture (in Kelvin). **[JEE 2006, 6/184, –1]**
Given, L_{fusion} = 80 cal/gm = 336 J/gm, $L_{vaporization}$ = 540 cal/gm = 2268 J/gm,

S_{ice} = 2100 J/kg K = 0.5 cal/gm K and S_{water} = 4200 J/kg K = 1 cal/gmK
(1) 273 K. (2) 373 K (3) 300 K (4) 253 K

4. The weight of person is 60 kg. If he gets 10^5 calories heat through food and the efficiency of his body is 28%, then upto how much height he can climb when he user entire energy gained is clmbing
(1) 100 m (2) 200 m (3) 400 m (4) 1000 m

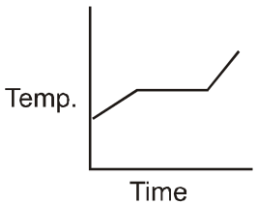
5. When a block of iron floats in mercury at 0°C a fraction k_1 of its volume is submerged, while at the temperature 60ºC, a fraction k_2 is seen to be submerged. If the coefficient of volume expansion of iron is γ_{Fe}, then the ratio $\frac{k_1}{k_2}$ can be expressed as: **[JEE '2001, 1/35]**
(1) $\frac{1+60\gamma_{Fe}}{1+60\gamma_{Hg}}$ (2) $\frac{1-60\gamma_{Fe}}{1+60\gamma_{Hg}}$ (3) $\frac{1+60\gamma_{Fe}}{1-60\gamma_{Hg}}$ (4) $\frac{1+60\gamma_{Hg}}{1+60\gamma_{Fe}}$

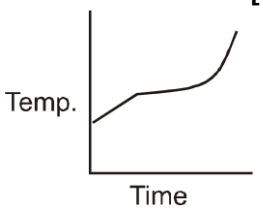
6. A hot wire of copper is stretched at a temperature of 150ºC between two fixed walls. At what temperature will the wire break when it is cooled? The breaking stress of copper is 2.45×10^8 N/m^2 Young's modulus of copper = 11.8×10^{10} N/m^2, coefficient of linear expansion of copper = 1.6×10^{-5}/ºC.
[RPMT-2014]
(1) 20.2ºC (2) 43.2ºC (3) 64.9ºC (4) 70.2ºC

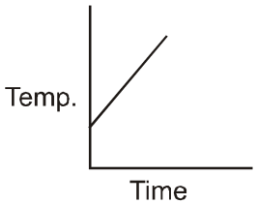
Exercise-3

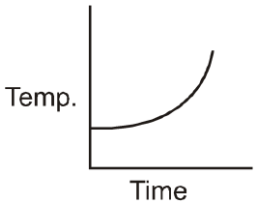
PART - I : NEET / AIPMT QUESTION (PREVIOUS YEARS)

1. Liquid oxygen at 50K is heated to 300 K at constant pressure of 1 atm. The rate of heating is constant. Which one of the following graphs represents the variation of temperature with time ?
[AIPMT_Pre_2012]

(1) 

(2) 

(3) 

(4) 

2. Steam at 100^0C is passed into 20g of water at 10^0C. When water acquires a temperature of 80^0C, the mass of water present will be: **[AIPMT-2014]**
[Take specific heat of water = 1 cal g^{-1} $^0C^{-1}$ and latent heat of steam = 540 cal g^{-1}]
(1) 24 g (2) 31.5 g (3) 42.5 g (4) 22.5 g

3. The value of coefficient of volume expansion of glycerin is 5×10^{-4} K^{-1}. The fractional chage in the density of glycerin for a rise of 40°C in its temperature, is:
(1) 0.020 (2) 0.025 (3) 0.010 (4) 0.015

4. a piece of ice falls from a height h so that it melts completely. Only one-quarter of the heat produced is absorbed by the ice and all energy of ice gets converted in to heat during its fall. The value of h is : [Latent heat of ice is 3.4×10^5 J/Kg and g = 10 N/kg] **[AIPMT-2016]**
(1) 68 km (2) 34 km (3) 544 km (4) 136 km

5. A sample of 0.1 g of water at 100ºC and normal pressure (1.013×10^5 Nm^{-2}) requires 54 cal of heat energy to convert to stream at 100ºC. If the volume of the steam produced is 167.1 cc, the change in internal energy of the sample, is : **[NEET 2018]**

(1) 104.3 J (2) 84.5 J (3) 42.2 J (4) 208.7 J

PART - II : JEE (MAIN) / AIEEE PROBLEMS (PREVIOUS YEARS)

1. A metal rod of Young's modulus Y and coefficient of thermal expansion α is held at its two ends such that its length remains invariant. If its temperature is raised by tºC, the linear stress developed in its is : **[AIEEE 2011, 11 MAY; 4, –1]**

(1) $\frac{Y}{\alpha t}$ (2) Yαt (3) $\frac{1}{(Y\alpha t)}$ (4) $\frac{\alpha t}{Y}$

2. An aluminium sphere of 20 cm diameter is heated from 0ºC to 100ºC. Its volume changes by (given that coefficient of linear expansion for aluminium $\alpha_{Al} = 23 \times 10^{-6}$/ºC) **[AIEEE 2011, 11 MAY; 4, –1]**

(1) 2.89 cc (2) 9.28 cc (3) 49.8 cc (4) 28.9 cc

3. A wooden wheel of radius R is made of two semicircular parts (see figure). The two parts are held together by a ring made of a metal strip of cross sectional area S and length L. L is slightly less than 2πR. To fit the ring on the wheel, it is heated so that its temperature rises by ΔT and it just steps over the wheel. As it cools down to surroundifng temperature, it presses the semicircular parts together. If the coefficient of linear expansion of the metal is α, and its Young's modulus is Y, the force that one part of the wheel applies on the other part is : **[AIEEE 2012 ; 4/120, –1]**

(1) 2πSYαΔT (2) SYαΔT (3) π SYαΔT (4) 2SYαΔT

4. A pendulum clock lose 12 s a day if the temperature is 40°C and gains 4 s a day if the temperature is 20°C. The temperature at which the clock will show correct time, and the co-efficient of linear expansion (α) of the metal of the pendulum shaft are respectively : **[JEE Main 2016]**

(1) 60°C ; $\alpha = 1.85 \times 10^{-4}$/°C (2) 30°C ; $\alpha = 1.85 \times 10^{-3}$/°C

(3) 55°C ; $\alpha = 1.85 \times 10^{-2}$/°C (4) 25°C ; $\alpha = 1.85 \times 10^{-5}$/°C

5. A copper ball of mass 100 gm is at a temperature T. It is dropped in a copper calorimeter of mass 100 gm, filled with 170 gm of water at room temperature. Subsequently, the temperature of the system is found to be 75º C. T is given by : (Given : room temperature = 30ºC, specific heat of copper = 0.1 cal/gmºC) **[JEE Main 2017]**

(1) 825º C (2) 800ºC (3) 885ºC (4) 1250ºC

6. An external pressure P is applied on a cube at 0°C so that it is equally compressed from all sides. K is the bulk modulus of the material of the cube and α is its coefficient of linear expansion. Suppose we want to bring the cube to its original size by heating. The temperature should be raised by : **[JEE Main 2017]**

(1) $3PK\alpha$ (2) $\frac{P}{3\alpha K}$ (3) $\frac{P}{\alpha K}$ (4) $\frac{3\alpha}{PK}$

7. An unknown metal of mass 192 g heated to a temperature of 100°C was immersed into a brass calorimeter of mass 128 g containing 240 g of water at a temperature of 8.4°C. Calculate the specific heat of the unknown metal if water temperature stabilizes at 21.5°C. (Specific heat of brass is 394 J kg^{-1} K^{-1}) **[JEE Main 2019]**

(1) 916 J kg^{-1} K^{-1} (2) 458 J kg^{-1} K^{-1} (3) 1232 J kg^{-1} K^{-1} (4) 654 J kg^{-1} K^{-1}

8. A metal ball of mass 0.1 kg is heated upto 500°C and dropped into a vessel of heat capacity 800 JK^{-1} and containing 0.5 kg water. The initial temperature of water and vessel is 30°C. What is the approximate percentage increment in the temperature of the water? [Specific Heat Capacities of water and metal are, respectively, 4200 $Jkg^{-1}K^{-1}$ and 400$Jkg^{-1}K^{-1}$] **[JEE Main 2019]**

(1) 30% (2) 25% (3) 15% (4) 20%

9. Two rods A and B of identical dimensions are at temperature 30°C. If A is heated upto 180°C and B upto T°C, then the new lengths are the same. If the ratio of the coefficients of linear expansion of A and B is 4 : 3, then the value of T is : **[JEE Main 2019]**

(1) 270°C (2) 200°C (3) 230°C (4) 250°C

10. Ice at -20°C is added to 50 g of water at 40° C. When the temperature of the mixture reaches 0°C, it is found that 20 g of ice is still unmelted. The amount of ice added to the water was close to (Specific heat of water = 4.2J/g/°C Specific heat of Ice = 2.1 J/g/°C **[JEE Main 2019]**
Heat of fusion of water at 0°C = 334 J/g

(1) 100 g (2) 40 g (3) 60 g (4) 50 g

Answers

EXERCISE - 1

SECTION (A)

1.	(4)	**2.**	(1)	**3.**	(3)	**4.**	(4)	**5.**	(3)	**6.**	(2)	**7.**	(2)
8.	(2)	**9.**	(2)	**10.**	(4)	**11.**	(1)	**12.**	(4)	**13.**	(1)	**14.**	(2)
15.	(1)	**16.**	(3)	**17.**	(3)	**18.**	(1)	**19.**	(3)	**20.**	(3)	**21.**	(1)
22.	(2)	**23.**	(2)	**24.**	(4)	**25.**	(1)	**26.**	(4)	**27.**	(1)	**28.**	(4)
29.	(2)	**30.**	(1)	**31.**	(1)	**32.**	(1)	**33.**	(3)	**34.**	(1)	**35.**	(1)
36.	(3)	**37.**	(1)	**38.**	(1)								

SECTION (B)

1.	(1)	**2.**	(3)	**3.**	(3)	**4.**	(1)	**5.**	(2)	**6.**	(3)	**7.**	(2)
8.	(2)	**9.**	(2)	**10.**	(1)	**11.**	(1)	**12.**	(1)	**13.**	(4)	**14.**	(4)
15.	(4)	**16.**	(4)	**17.**	(3)	**18.**	(2)	**19.**	(3)	**20.**	(1)	**21.**	(3)
22.	(3)	**23.**	(1)	**24.**	(1)	**25.**	(1)	**26.**	(2)	**27.**	(2)	**28.**	(3)

SECTION (C)

1.	(1)	**2.**	(1)	**3.**	(1)	**4.**	(3)	**5.**	(3)	**6.**	(2)	**7.**	(3)
8.	(2)	**9.**	(3)	**10.**	(1)	**11.**	(4)	**12.**	(1)	**13.**	(3)	**14.**	(3)
15.	(3)	**16.**	(2)										

EXERCISE - 2

1.	(1)	**2.**	(1)	**3.**	(1)	**4.**	(2)	**5.**	(1)	**6.**	(1)

EXERCISE - 3

PART – I

1.	(1)	**2.**	(4)	**3.**	(1)	**4.**	(4)	**5.**	(4)				

PART – II

1.	(2)	**2.**	(4)	**3.**	(4)	**4.**	(4)	**5.**	(3)	**6.**	(2)	**7.**	(1)
8.	(4)	**9.**	(3)	**10.**	(2)								