1. **An iron tyre is to be fitted on to a wooden wheel 1*m* in diameter. The diameter of tyre is 6 *mm* smaller than that of wheel. The tyre should be heated so that its temperature increases by a minimum of (the coefficient of cubical expansion of iron is 3.6 × 10–5/º*C*)**

(a) 167º*C* (b) 334º*C* (c) 500º*C* (d) 1000º*C*

1. **A steel scale measures the length of a copper wire as  when both are at  (the calibration temperature for scale). What would be the scale read for the length of the wire when both are at ? (Given *α*steel per°*C* and αcopper )**

(a)  (b)  (c)  (d) 

1. **A piece of metal weight 46 *gm* in air, when it is immersed in the liquid of specific gravity 1.24 at 27º*C* it weighs 30 *gm*. When the temperature of liquid is raised to 42º*C* the metal piece weight 30.5 *gm*, specific gravity of the liquid at 42º*C* is 1.20, then the linear expansion of the metal will be**

(a) 3.316 × 10–5/º*C* (b) 2.316 × 10–5/º*C* (c) 4.316 × 10–5/º*C*(d) None of these

1. **Steam at 100º*C* is passed into 1.1 *kg* of water contained in a calorimeter of water equivalent 0.02 *kg* at 15º*C* till the temperature of the calorimeter and its contents rises to 80º*C*. The mass of the steam condensed in *kg* is**

(a) 0.130 (b) 0.065 (c) 0.260 (d) 0.135

1. **2 *kg* of ice at – 20°*C* is mixed with 5 *kg* of water at 20°*C* in an insulating vessel having a negligible heat capacity. Calculate the final mass of water remaining in the container. It is given that the specific heats of water and ice are 1 *kcal*/*kg per* °*C* and 0.5 *kcal*/*kg*/°*C* while the latent heat of fusion of ice is 80 *kcal*/*kg***

(a) 7 *kg* (b) 6 *kg* (c) 4 *kg*(d) 2 *kg*

1. **Water of volume 2 *litre* in a container is heated with a coil of  at . The lid of the container is open and energy dissipates at rate of  In how much time temperature will rise from  to  [Given specific heat of water is ]**

(a) 8 *min* 20 *s* (b) 6 *min* 2 *s* (c) 7 *min* (d) 14 *min*

1. **A lead bullet at 27°*C* just melts when stopped by an obstacle. Assuming that 25% of heat is absorbed by the obstacle, then the velocity of the bullet at the time of striking (M.P. of lead = 327°*C*, specific heat of lead = 0.03 *cal*/*gm*°*C*, latent heat of fusion of lead = 6 *cal*/*gm* and *J* = 4.2 *joule*/*cal*)**

(a) 410 *m*/*sec* (b) 1230 *m*/*sec* (c) 307.5 *m*/*sec* (d)None of the above

1. **In an industrial process 10 *kg* of water per hour is to be heated from 20°*C* to 80°*C*. To do this steam at 150°*C* is passed from a boiler into a copper coil immersed in water. The steam condenses in the coil and is returned to the boiler as water at 90°*C*. how many *kg* of steam is required per hour.**

**(Specific heat of steam = 1 *calorie* per *gm*°*C*, Latent heat of vaporisation = 540 *cal*/*gm*)**

(a) 1 *gm* (b) 1 *kg* (c) 10 *gm*(d) 10 *kg*

1. **Three rods of equal length *l* are joined to form an equilateral triangle *PQR*. *O* is the mid point of *PQ*. Distance *OR* remains same for small change in temperature. Coefficient of linear expansion for *PR* and *RQ* is same *i.e.*  but that for *PQ* is . Then**

(a) 

*P*

*Q*

*O*

*R*

(b) 

(c) 

(d) 

1. **10 *gm* of ice at – 20°*C* is dropped into a calorimeter containing 10 *gm* of water at 10°*C*; the specific heat of water is twice that of ice. When equilibrium is reached, the calorimeter will contain**

(a) 20 *gm* of water

(b) 20 *gm* of ice

(c) 10 *gm* ice and 10 *gm* water

(d) 5 *gm* ice and 15 *gm* water

1. **A rod of length 20 *cm* is made of metal. It expands by 0.075*cm* when its temperature is raised from 0°*C* to 100°*C*. Another rod of a different metal *B* having the same length expands by 0.045 *cm* for the same change in temperature. A third rod of the same length is composed of two parts, one of metal *A* and the other of metal *B*. This rod expands by 0.060 *cm* for the same change in temperature. The portion made of metal *A* has the length**

(a) 20 *cm* (b) 10 *cm* (c) 15 *cm* (d) 18 *cm*

1. **Ice starts forming in lake with water at  and when the atmospheric temperature is . If the time taken for 1 *cm* of ice be 7 *hours*, then the time taken for the thickness of ice to change from 1 *cm* to 2 *cm* is**

(a) 7 *hours* (b) 14 *hours* (c) Less than 7 *hours* (d) More than 7 *hours*

1. **A cylinder of radius *R* made of a material of thermal conductivity  is surrounded by a cylindrical shell of inner radius *R* and outer radius 2*R* made of material of thermal conductivity . The two ends of the combined system are maintained at two different temperatures. There is no loss of heat across the cylindrical surface and the system is in steady state. The effective thermal conductivity of the system is**

(a)  (b)  (c)  (d) 

1. **Three rods made of the same material and having the same cross section have been joined as shown in the figure. Each rod is of the same length. The left and right ends are kept at  and  respectively. The temperature of the junction of the three rods will be**

0o*C*

90o*C*

90o*C*

*A*

*B*

*C*

(a) 

(b) 

(c) 

(d) 

1. **The only possibility of heat flow in a thermos flask is through its cork which is 75 *cm*2 in area and 5 *cm* thick. Its thermal conductivity is 0.0075 *cal/cmsec*o*C*. The outside temperature is 40o*C* and latent heat of ice is 80 *cal g*–1. Time taken by 500 *g* of ice at 0o*C* in the flask to melt into water at 0o*C* is**

(a) 2.47 *hr*

(b) 4.27 *hr*

(c) 7.42 *hr*

(d) 4.72 *hr*

1. **Three rods of the same dimension have thermal conductivities 3*K,* 2*K* and *K.* They are arranged as shown in fig. Given below, with their ends at 100o*C*, 50o*C* and 20o*C*. The temperature of their junction is**

100o*C*

50o*C*

20o*C*

3*K*

2*K*

*K*

(a) *C*

(b)  *C*

(c) 50o *C*

(d) 35o *C*

1. **Two identical conducting rods are first connected independently to two vessels, one containing water at 100o *C* and the other containing ice at 0o*C*. In the second case, the rods are joined end to end and connected to the same vessels. Let *q*1 and *q2*  g / s be the rate of melting of ice in two cases respectively. The ratio of ** is**

(a)  (b)  (c)  (d) 

1. **Three rods of same dimensions are arranged as shown in figure they have thermal conductivities  and The points *P* and *Q* are maintained at different temperatures for the heat to flow at the same rate along *PRQ*  and *PQ* then which of the following option is correct**

(a) 

*R*

*P*

*Q*

*K*1

*K*2

*K*3

(b) 

(c) 

(d) 

1. **The figure shows a system of two concentric spheres of radii *r*1 and *r*2 and kept at temperatures *T*1 and *T*2, respectively. The radial rate of flow of heat in a substance between the two concentric spheres is proportional to**

(a) ****

*r*1

*T*1

*r*2

*T*2

(b) 

(c) 

(d) In 

1. **Four rods of identical cross-sectional area and made from the same metal form the sides of square. The temperature of two diagonally opposite points and *T* and *T* respective in the steady state. Assuming that only heat conduction takes place, what will be the temperature difference between other two points**

(a)  (b) (c) 0 (d) None of these

1. **An ideal gas is taken around *ABCA* as shown in the above *P-V* diagram. The work done during a cycle is**

(a) 2*PV*

*B*

*C*

(*P,* 3*V*)

*P*

*E*

*D*

*V*

*A*

(*P,V*)

(3*P,* 3*V*)

(b) *PV*

(c) 1/2*PV*

(d) Zero

1. **An ideal gas of mass *m* in a state *A* goes to another state *B* via three different processes as shown in figure. If  and  denote the heat absorbed by the gas along the three paths, then**

*V*

1

2

3

*B*

*A*

*P*

(a) ****

(b) 

(c) 

(d) 

1. **A thermodynamic process is shown in the figure. The pressures and volumes corresponding to some points in the figure are :  and **

**In process *AB*, 600 *J* of heat is added to the system and in process *BC*, 200 *J* of heat is added to the system. The change in internal energy of the system in process *AC* would be**

*V*

*P*

*D*

*A*

*B*

*C*

*O*

(a) 560 *J*

(b) 800 *J*

(c) 600 *J*

(d) 640 *J*

1. **An ideal gas is taken through the cycle *A* → *B* → *C* → *A*, as shown in the figure. If the net heat supplied to the gas in the cycle is 5 *J*, the work done by the gas in the process *C* → *A* is**

(a) – 5 *J*

*C*

*A*

*B*

10

2

1

*V*(*m*3)

*P*(*N/m*2)

(b) – 10 *J*

(c) – 15 *J*

(d) – 20 *J*

1. **In the following indicator diagram, the net amount of work done will be**

1

2

*P*

*V*

(a) Positive

(b) Negative

(c) Zero

(d) Infinity

1. **In the figure given two processes *A* and *B* are shown by which a thermo-dynamical system goes from initial to final state *F*. If  and  are respectively the heats supplied to the systems then**

*P*

*V*

*i*

*A*

*B*

*f*

(a) 

(b) 

(c) 

(d) ****

1. **In the cyclic process shown in the figure, the work done by the gas in one cycle is**

(a) 

*V*1

4*V*1

*P*1

7*P*1

*P*

*V*

(b) 

(c) 

(d) ****

1. **An ideal gas is taken around the cycle *ABCA* as shown in the *P-V* diagram. The net work done by the gas during the cycle is equal to**

3*V*1

*P*

*V*1

*P*1

3*P*1

*B*

*A*

*C*

(a) 

(b) 

(c) ****

(d) 

1. **Heat energy absorbed by a system in going through a cyclic process shown in figure**

(a) 107 *π J*

30

10

10

30

*P* (*kPa*)

*V* (*litre*)

(b) 104 *π J*

(c) 102*π J*

(d) 

1. **An ideal gas is taken from point *A* to the point *B,* as shown in the *P-V* diagram, keeping the temperature constant. The work done in the process**

*P*

*PA*

*PB*

*O*

*V*

*VA*

*VB*

*A*

*B*

(a) 

(b) 

(c) 

(d) 

1. **Six moles of an ideal gas perfomrs a cycle shown in figure. If the temperature are *TA* = 600 *K*, *TB* = 800 *K*, *TC*­ = 2200 *K* and *TD* = 1200 *K*, the work done per cycle is**

(a) 20 *kJ*

(b) 30 *kJ*

*P*

*T*

*D*

*A*

*C*

*B*

(c) 40 *kJ*

(d) 60 *kJ*