NEET PHYSICS 2018-19 - Chennai

Test ID : 039 **Test date: 17.04.2019**

Number of questions: 60 **Time**: 3HRS

Name: _______________________________

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Negative Marks : 4 marks for correct attempt & 1 mark deducted for every wrong attempt.

1. As the temperature is increased, the time period of a pendulum
   a) increase as its effective length increases even though its centre of mass
   b) decreases as its effective length increases even though its centre of mass still remains at the centre of the bob
   c) increases as its effective length increases due to shifting of centre of mass below the centre of the bob
   d) increases as its effective length remains same but the centre of mass shifts above the centre of the bob

2. Two slabs A and B of different materials but of the same thickness are joined end to form a composite slab. The thermal conductivities of A and B are K_1 and K_2 respectively. A steady temperature difference of 12^0C is maintained across the composite slab. If $K_1 = \frac{K_2}{2}$, the temperature difference across slabs A is
   a) 4^0 C
   b) 6^0 C
   c) 8^0 C
   d) 10^0 C

3. The two ends of a metal rod are maintained at temperature 100^0C and 110^0C. The rate of heat flow in the rod is found to be 4.0 J/s. If the ends are maintained at temperatures 200^0 C and 210^0C, the rate of heat flow will be
   a) 44.0 J/s
   b) 16.8 J/s
   c) 8.0 J/s
   d) 4.0 J/s

4. If the radius of a star is R and its acts as a black body, what would be the temperature of the star in which the rate of energy production is Q?
   a) $\frac{Q}{4\pi R^2\sigma}$
   b) $\left(\frac{Q}{4\pi R^2\sigma}\right)^{1/2}$
   c) $\left(\frac{4\pi R^2 Q}{\sigma}\right)^{1/4}$
   d) $\left(\frac{Q}{4\pi R^2\sigma}\right)^{1/4}$

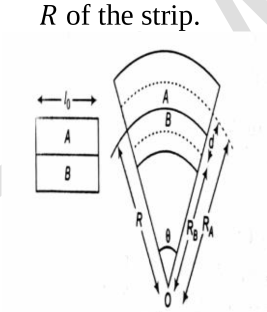
5. The total radiant energy per unit area, normal to the direction of incidence, received at a distance R from the centre of a star of radius r, whose outer surface radiates as a black body at a temperature T K is given by
   a) $\frac{\sigma r^2 T^4}{R^2}$
   b) $\frac{\sigma r^2 T^4}{4\pi r^2}$
   c) $\frac{\sigma r^2 T^4}{r^4}$
   d) $\frac{4\pi\sigma r^2 T^4}{R^2}$

6. An aluminium sphere is dipped into water. Which of the following is true?
   a) Buoyancy will be less in water at 0^0 C than that in water 4^0 C
   b) Buoyancy will be more in water at 0^0 C than that in water 4^0 C
   c) Buoyancy in water at 0^0 C will be same as that in water 4^0 C
   d) Buoyancy may be more or less in water at 4^0 C depending on the radius of the sphere

7. Certain quantity of water cools from 70^0 C to 60^0 C in the first 5 minutes and to 54^0 C in the next 5 minutes. The temperature of the surroundings is
a) 45^0 C
b) 20^0 C
c) 42^0 C
d) 10^0 C

8. Steam at 100^0C is passed into 20g of water at 10^0 C. When water acquires temperature of 80^0 C, the mass of water present will be(Take, specific heat of water = 1 cal $g^{-1}\,{}^0C^{-1}$ and latent heat of steam = 540 cal g^{-1}
a) 24 g
b) 31.5 g
c) 42.5 g
d) 22.5 g

9. At temperature T_0, two metal strips of length l_0 and thickness d, is bolted, so that their ends coincide. The upper strip is made up of metal A and have coefficient of expansion α_A and lower strip is made up of metal B with coefficient of expansion α_B $(\alpha_A > \alpha_B)$.When temperature of their blastic strip is increased from T_0 to $(T_0 + \Delta T)$, one strip becomes longer than the other and blastic strip is bend in the form of a circle as shown in figure. Calculate the radius of curvature R of the strip.

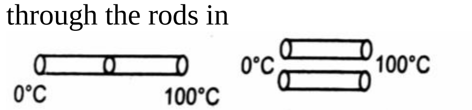


a) $R = \frac{[2+(\alpha_A+\alpha_B)\,\Delta T]d}{2\,(\alpha_A-\alpha_B)\,\Delta T}$
b) $R = \frac{[2-(\alpha_A+\alpha_B)\,\Delta T]d}{2\,(\alpha_A-\alpha_B)\,\Delta T}$
c) $R = \frac{[2+(\alpha_A-\alpha_B)\,\Delta T]d}{2\,(\alpha_A-\alpha_B)\,\Delta T}$
d) $R = \frac{[2-(\alpha_A-\alpha_B)\,\Delta T]d}{2\,(\alpha_A-\alpha_B)\,\Delta T}$

10. A wall has two layers A and B, each made of different materials. Both the layers have the same thickness. The thermal conductivity for A is twice of B and under steady condition, the temperature difference across the wall is 36^0C. The temperature difference across the layer A is
a) 6^0 C
b) 12^0 C
c) 24^0 C
d) 18^0 C

11. The specific heat of a substance at temperature t^0C is $s = at^2 + bt + c$. The amount of heat required to raise the temperature of m kg of the substance from 0^0C to $t_0\,{}^0$C is
a) $\frac{mt_0^3a}{3} + \frac{bt_0^2}{2} + ct_0$
b) $\frac{mt_0^3a}{3} + \frac{mbt_0^2}{2} + mct_0$
c) $\frac{mt_0^3a}{3} + \frac{mbt_0^2}{2}$
d) None of these

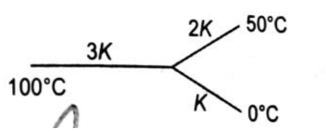
12. Two identical square rods of metal are welded end to end as shown in Fig. (i), 20 cal of heat flows through it in 4 min. If the rods are welded as shown in Fig. (ii), the same amount of heat will flow through the rods in



a) 1 min
b) 2 min
c) 4 min
d) 16 min

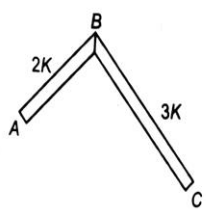
13. Assuming the sun to have a spherical outer surface of radius r, radiating like a black body at temperature t^0C, the power received by a unit surface, (normal to the incident rays) at a distance R from the centre of the sun is
a) $\frac{4\pi r^2 t^4}{R^2}$
b) $\frac{r^2\sigma(\mathrm{t}+273)4}{4\pi R^2}$
c) $\frac{16\pi^2 r^2\sigma t^4}{R^2}$
d) $\frac{r^2\sigma(\mathrm{t}+273)4}{R^2}$

14. Three rods of same dimensions have thermal conductivities $3K$, $2K$ and K. They are arranged as shown, with their ends at 100^0C, 50^0C and 0^0C. The temperature of their junction is



a) 75^0 C
b) $\frac{200}{3}$ ^{0}C
c) 40^0 C
d) $\frac{100}{3}$ ^{0}C

15. In the figure, ABC is a conducting rod whose lateral surfaces are insulated. The length of the section AB is one-half of that of BC and the respective thermal conductivities of the two sections are as given in the figure. If the ends A and C are maintained at 0^0C and 70^0C respectively, the temperature of junction B in the steady state is



a) 30^0C
b) 40^0C
c) 50^0C
d) 60^0C

16. A non-conducting body floats in a liquid at 20^0C with $\frac{2}{3}$ of its volume immersed in the liquid. When liquid temperature is increased to 100^0C, $\frac{3}{4}$ of body's volume is immersed in the liquid. Then the coefficient of real expansion of the liquid is (neglecting the expansion of container of the liquid)
a) 15.6×10^{-4} ^{0}C $^{-1}$
b) 156×10^{-4} ^{0}C $^{-1}$
c) 1.56×10^{-4} ^{0}C $^{-1}$
d) 0.156×10^{-4} ^{0}C $^{-1}$

17. A black body at a temperature of 2600 K has the wavelength corresponding to maximum emission 1200 Å assuming the moon to be perfectly black body. The temperature of the moon, if the wavelength corresponding to maximum emission is 5000 Å, is
a) 7800 K
b) 6240 K
c) 5240 K
d) 3640 K

18. A sphere, a cube and a thin circular plate, all of same material and of same mass are initially heated to same high temperature
a) plate will cool fastest and cube the slowest
b) sphere will cool fastest and cube the slowest
c) plate will cool fastest and sphere the slowest
d) cube will cool fastest and plate the slowest

19. A clock with a metal pendulum beating seconds keeps correct time at 0^0C. If it loses 12.5 s a day at 25^0C, the coefficient of linear expansion of metal pendulum is
a) $\frac{1}{86400}$ / ^{0}C
b) $\frac{1}{43200}$ / ^{0}C
c) $\frac{1}{14400}$ / ^{0}C
d) $\frac{1}{28800}$ / ^{0}C

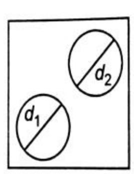
20. An experiment takes 10 min to raise temperature of water from 0^0C and 100^0C and another 55 min to convert it totally into steam by a stabilized heater. The latent heat of vaporization comes out to be
a) 530 cal/g
b) 540 cal/g
c) 550 cal/g
d) 560 cal/g

21. If λ_m denotes the wavelength at which the radiative emission from a black body at a temperature T K is maximum, then
   a) $\lambda_m \propto T^4$
   b) λ_m is independent of T
   c) $\lambda_m \propto T$
   d) $\lambda_m \propto T^{-1}$

22. A sphere has a surface area of $1.0 m^2$ and a temperature of 400 K and the power radiated from it is 150 W. Assuming the sphere is a black body radiator, the power in kilowatt radiated when the area expands to $2.0 m^2$ and the temperature changes to 800 K is
   a) 6.2
   b) 9.6
   c) 4.8
   d) 16

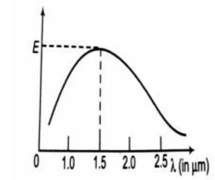
23. In similar calorimeters, equal volumes of water and alcohol when poured take 100 s and 74 s respectively to cool from 50^0C to 40^0C. If the thermal capacity of each calorimeter is numerically equal to volume of either liquid, then the specific heat capacity of alcohol is (Given, relative density of alcohol as 0.8 and specific heat capacity of water as 1 cal/g/^{0}C)
   a) 0.8 cal/g^{0}C
   b) 0.6 cal/g^{0}C
   c) 0.9 cal/g^{0}C
   d) 1 cal/g^{0}C

24. The metal sheet as shown in figure with two holes cut-off unequal diameters d_1 and d_2 $(d_1 > d_2)$. If the sheet is heated,



   a) both d_1 and d_2 will decrease
   b) both d_1 and d_2 will increase
   c) d_1 will increase, d_2 will decrease
   d) d_1 will decrease, d_2 will increase

25. In the figure, the distribution of energy density of the radiation emitted by a black body at a given temperature is shown. The possible temperature of the black body at λ_m = 1.5 μm is

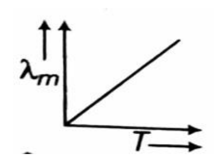


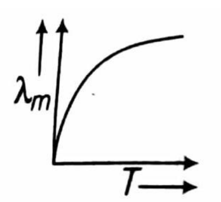
   a) 1500 K
   b) 2000 K
   c) 2500 K
   d) 3000 K

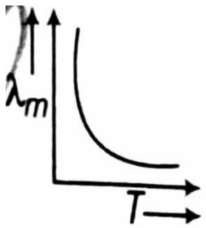
26. A piece of iron is heated in a flame. If first becomes dull red then becomes reddish yellow and finally turns to white hot. The correct explanation for the above observations is possible by using
   a) Stefan's law
   b) Wien's displacement law
   c) Kirchhoff's law
   d) Newton's law of cooling

27. Which of the following is the $\lambda_m - T$ graph for a perfectly black body?

a) 

b) 

c) 

d) 

28. The surface temperature of the sun is T K and the solar constant for a plate is S. The sun subtends an angle 0 at the planet. Then,
a) $S \propto T^4$
b) $S \propto T^2$
c) $S \propto 0^2$
d) $S \propto 0$

29. A black body calorimeter filled with hot water cools from 60^0C to 50^0C in 4 min and 40^0C to 30^0C in 8 min. The approximate temperature of surrounding is
a) 10^0C
b) 15^0C
c) 20^0C
d) 25^0C

30. A black body at 1227^0C emits radiations with maximum intensity at a wavelength of 5000 Å. If the temperature of the body is increased by 1000^0 C, the maximum intensity will be observed at
a) 4000 Å
b) 5000 Å
c) 6000 Å
d) 3000 Å

31. A particle moves from a point ($-2\hat{\imath}$ + $5\hat{\jmath}$) to ($4\hat{\jmath}$ + $3\hat{k}$) when a force of ($4\hat{\imath}$ + $3\hat{\jmath}$) N is applied. How much work has been done by the force?
a) 8 J
b) 11 J
c) 5 J
d) 2 J

32. Two similar springs P and Q have spring constants K_P and K_Q , such that $K_P > K_Q$. They are stretched, first by the same amount (case a), then by the same force (case b). The work done by the springs W_P and W_Q are related as, in case (a) and case (b), respectively
a) $W_P = W_Q$; $W_P > W_Q$
b) $W_P = W_Q$; $W_P = W_Q$
c) $W_P > W_Q$; $W_Q > W_P$
d) $W_P < W_Q$; $W_Q < W_P$

33. The heart of a man pumps 5 L of blood through the arteries per minute at a pressure of 150 mm of mercury. If the density of mercury be 13.6×10^3 kg/m^3 and g= 10 m/s^2, then the power of heart in watt is
a) 1.70
b) 2.35
c) 3.0
d) 1.50

34. Two particles of masses m_1 , m_2 move with initial velocities u_1 and u_2. On collision, one of the particles get excited to higher level, after absorbing energy ε. If final velocities of particles be v_1 and v_2 , then we must have
a) $m_1^2 u_1 + m_2^2 u_2 - \varepsilon = m_1^2\, v_1 + m_2^2\, v_2$
b) $\frac{1}{2} m_1\, u_1^2 + \frac{1}{2} m_2\, u_2^2 = \frac{1}{2} m_1\, v_1^2 + \frac{1}{2} m_2\, v_2^2 - \varepsilon$
c) $\frac{1}{2} m_1\, u_1^2 + \frac{1}{2} m_2\, u_2^2 - \varepsilon = \frac{1}{2} m_1\, v_1^2 + \frac{1}{2} m_2\, v_2^2$
d) $\frac{1}{2} m_1^2\, u_1^2 + \frac{1}{2} m_2^2\, u_2^2 + \varepsilon = \frac{1}{2} m_1^2\, v_1^2 + \frac{1}{2} m_2^2 v_2^2$

35. A uniform force of $(3\hat{\imath} + \hat{\jmath})$ N acts on a particle of mass 2kg. Hence, the particle is displaced from position $(2\hat{\imath} + \hat{k})$ m to position $(4\hat{\imath} + 3\hat{\jmath} - \hat{k})$ m. The work done by the force on the particle is
a) 9 J
b) 6 J
c) 13 J
d) 15 J

36. A body of mass (4m) is lying in xy - plane at rest. It suddenly explodes into three pieces. Two pieces each of mass (m) move perpendicular to each other with equal speed (v). The total kinetic energy generated due to explosion is
a) mv^2
b) $\frac{3}{2}mv^2$
c) $2mv^2$
d) $4mv^2$

37. A bomb of mass 30 kg at rest explodes into two pieces of masses 18 kg and 12 kg. The velocity of 18 kg mass is 6 ms^{-1}. The kinetic energy of the other mass is
a) 256 J
b) 486 J
c) 524 J
d) 324 J

38. Two bodies with kinetic energies in the ratio 4:1 are moving with equal linear momentum. The ratio of their masses is
a) 1 : 2
b) 1 : 1
c) 4 : 1
d) 1 : 4

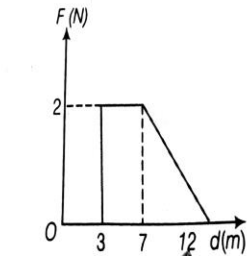
39. A bullet of mass 10g leaves a rifle at an initial velocity of 1000 m/s and strikes the earth at the same level with a velocity of 500 m/s. The work done in joule to overcome the resistance of air will be
a) 375
b) 3750
c) 5000
d) 500

40. Two identical balls A and B moving with velocities + 0.5 m/s and - 0.3 m/s respectively, collide head on elastically. The velocity of the balls A and B after collision will be respectively
a) +0.5 m/s and 0.3 m/s
b) - 0.3 m/s and 0.5 m/s
c) +0.3 m/s and 0.5 m/s
d) -0.5 m/s and 0.3 m/s

41. The KE acquired by a mass m in travelling a certain distance d, starting from rest, under the action of a constant force is directly proportional to
a) m
b) $\sqrt{m}$
c) $\frac{1}{\sqrt{m}}$
d) Independent of m

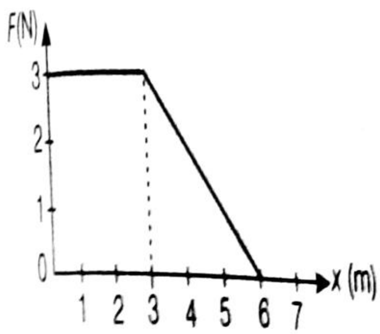
42. An engine pumps water through a hosepipe. Water passes through the pipe and leave it with a velocity of 2 ms^{-1}. The mass per unit length of water in the pipe is 100 kg m^{-1}. What is the power of the engine?
a) 400 W
b) 200 W
c) 100 W
d) 800 W

43. Force F on a particle moving in a straight line varies with distance d as shown in the figure. The work done on the particle during its displacement of 12 m is



a) 21 J
b) 26 J
c) 13 J
d) 18 J

44. A force F acting on an object varies with distance x as shown here. The force is in newton and x is in metre. The work done by the force in moving the object from $x = 0$ to $x = 6m$ is



a) 4.5 J
b) 13.5 J
c) 9.0 J
d) 18.0 J

45. A block of mass M is attached to the lower end of a vertical spring. The spring is hung from a ceiling and has force constant value k. The mass is released from rest with the spring initially unstretched. The maximum extension produced in the length of the spring will be

a) Mg/k
b) $2\,Mg/k$
c) $4\,Mg/k$
d) $Mg/2k$

46. The potential energy of a particle in a force field is $U = \frac{A}{r^2} - \frac{B}{r}$, where A and B are positive constants and r is the distance of particle from the centre of the field. For stable equilibrium, the distance of the particle is

a) $B/2A$
b) $2\,A/B$
c) A/B
d) B/A

47. A stone is tied to a string of length l and is whirled in a vertical circle with the other end of the string as the centre. At a certain instant of time, the stone is at its lowest position and has a speed u. The magnitude of the change in velocity as it reaches a position where the string is horizontal (g being acceleration due to gravity) is

a) $\sqrt{2(u^2 - gl)}$
b) $\sqrt{(u^2 - gl)}$
c) $u - \sqrt{(u^2 - 2gl)}$
d) $\sqrt{2gl}$

48. A ball of mass 2kg and another of mass 4kg are dropped together from a 60 ft tall building. After, a fall of 30ft each towards earth, their respective kinetic energies will be in the ration of

a) $\sqrt{2} : 1$
b) 1 : 4
c) 1 : 2
d) $1 : \sqrt{2}$

49. If kinetic energy of a body is increased by 300%, then percentage change in momentum will be

a) 100%
b) 150%
c) 265%
d) 73.2%

50. A force acts on a 3.0g particle in such a way that the position of the particle as a function of time is given by $x = 3t - 4t^2 + t^3$, where x is in metre and t in second. The work done during the first 4 s is

a) 570 mJ
b) 450 mJ
c) 490 mJ
d) 528 mJ

51. A metal ball of mass 2 kg moving with a velocity of 36km/h has a head on collision with a stationary ball of mass 3 kg. If after the collision, the two balls move together, the loss in kinetic energy due to collision is

a) 140 J
b) 100 J
c) 60 J
d) 40 J

52. An explosion blows a rock into three parts. Two parts go off at right angles to each other. These two are, 1 kg first part moving with a velocity of 12 ms^{-1} and 2 kg second part moving with a velocity of 8 ms^{-1}. If the third part flies off with a velocity of 4 ms^{-1}, its mass would be

a) 5 kg
b) 7 kg
c) 17 kg
d) 3 kg

53. Water falls from a height of 60 m at the rate of 15kg/s to operate a turbine. The losses due to frictional forces are 10% of energy. How much power is generated by the turbine? (Take g = 10 m/s^2)

a) 8.1 kW
b) 10.2 kW
c) 12.3 kW
d) 7.0 Kw

54. A body of mass 3 kg is under a constant force, which causes a displacement s in metre in it, given by the relation $s = \frac{1}{3}t^2$, where t is in second. Work done by the force is 2 s is

a) $\frac{5}{19}$ J
b) $\frac{3}{8}$ J
c) $\frac{8}{3}$ J
d) $\frac{19}{5}$ J

55. A particle of mass m_1 is moving with a velocity v_1 and another particle of mass m_2 is moving with a velocity v_2. Both of them have the same momentum, but their different kinetic energies are E_1 and E_2 respectively. If $m_1 > m_2$, then

a) $E_1 < E_2$
b) $\frac{E_1}{E_2} = \frac{m_1}{m_2}$
c) $E_1 > E_2$
d) $E_1 = E_2$

56. The potential energy of a system increases, if work is done

a) By the system against a conservative force
b) By the system against a non-conservative force
c) Upon the system by a conservative force
d) Upon the system by a non-conservative force

57. If the momentum of a body is increased by 50%, then the percentage increase in its kinetic energy is

a) 50%
b) 100%
c) 125%
d) 200%

58. A body of mass m moving with velocity 3km / h collides with a body of mass 2 m at rest. Now, the coalesced mass starts to move with a velocity

a) 1 km/h
b) 2 km/h
c) 3 km/h
d) 4 km/h

59. A block of mass 10 kg, moving in x- direction with a constant speed of 10 ms $^{-1}$, is subjected to a retarding force F = 0.1 $x\ J/m$ during its travel from x = 20 m to 30m. Its final KE will be

a) 475 J
b) 450 J
c) 275 J
d) 250 J

60. A particle of mass m is driven by a machine that delivers a constant power k watts. If the particle starts from rest, the force on the particle at time t is

a) $\sqrt{\frac{mk}{2}}\, t^{-1/2}$
b) $\sqrt{mk}\ t^{-1/2}$
c) $\sqrt{2mk}\ t^{-1/2}$
d) $\frac{1}{2}\sqrt{mk}\ t^{-1/2}$