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Previous Year Paper

Physics - 2003

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Multiple Choice Questions

1. If the velocity of light c , gravitational constant G and Planck's constant h are chosen as fundamental units, the dimensions of length L in the new system is

- A. $[h^1 c^1 G^{-1}]$
- B. $[h^{1/2} c^{1/2} G^{-1/2}]$
- C. $[h^1 c^{-3} G^1]$
- D. $[h^{1/2} c^{-3/2} G^{1/2}]$

Answer

2. A plate has a length 5 ± 0.1 cm and breadth 2 ± 0.01 cm. Then the area of the plate is

- A. $10 \pm 0.1 \text{ cm}^2$
- B. $10 \pm 0.01 \text{ cm}^2$
- C. $10 \pm 0.001 \text{ cm}^2$
- D. $10 \pm 1 \text{ cm}^2$

Answer

3. A ball hangs from a string inside a train moving along a horizontal straight track. The string is observed to incline towards the rear of the train making a constant small angle with the vertical. It shows that the train is

- A. moving with a uniform acceleration
- B. moving with a uniform velocity
- C. moving with a uniform retardation
- D. moving with an acceleration which is increasing uniformly

Answer

4. A particle moves along Y-axis in such a way that its y-coordinate varies with time t according to the relation $y = 3 + 5t^2 + 7t^3$. The initial velocity and acceleration of the particle are respectively

- A. 14 ms^{-1} , -5 ms^{-2}
- B. 19 ms^{-1} , -9 ms^{-2}
- C. 5 ms^{-1} , 14 ms^{-2}
- D. 3 ms^{-1} , -5 ms^{-2}

Answer

5. An object travels north with a velocity of 10 ms^{-1} and then speeds up to a velocity of 25 ms^{-1} in 5 s. Like. Share. Bookmark. Download. Make Notes. Print - Your Favourite Questions. Join www.zigya.com

A. 3 ms^{-1} in north direction

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~~B. 3 ms^{-2} in north direction~~

C. 15 ms^{-2} in north direction

D. 3 ms^{-2} in south direction

Answer

6. An automobile is travelling at 50 km/h , can be stopped at a distance of 40 m by applying brakes. If the same automobile is travelling at 90 km/h , all other conditions remaining same and assuming no skidding, the minimum stopping distance in metres is

A. 72

B. 92.5

C. 102.6

D. 129.6

Answer

7. A rifle shoots a bullet with a muzzle velocity of 500 ms^{-1} at a small target 50 m away. To hit the target the rifle must be aimed (take $g = 10 \text{ ms}^{-2}$)

A. exactly at the target

B. 10 cm below the target

C. 5 cm above the target

D. 5 cm below the target

Answer

8. The centripetal acceleration of particle of mass m moving with a velocity v in a circular orbit of radius r is

A. v^2/r along the radius, towards the centre

B. v^2/r along the radius, away from the centre

C. mv^2/r along the radius, away from the centre

D. mv^2/r along the radius, towards the centre

Answer

9. An α -particle of mass m suffers one dimensional elastic collision with a nucleus of unknown mass. After the collision the α -particle is scattered directly backwards losing 75% of its kinetic energy. Then the mass of the nucleus is

A. m

B. $2m$

C. $3m$

D. $32 m$

Answer

10. While driving a car around a curve of 200 m radius, the driver notices that a simple pendulum
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hung to the rear of the car is making an angle of 15° to the horizontal. The speed of the car in km/h is

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- A. 60.5
B. 72.5
C. 82.5
D. 92.5

Answer

11. A stationary body of mass m explodes into three parts having masses in the ratio 1 : 3 : 3. The two fractions with equal masses move at right angles to each other with a velocity of 1.5 ms^{-1} . Then the velocity of the third body is
- A. 4.52 ms^{-1}
B. 5 ms^{-1}
C. 532 ms^{-1}
D. 1.5 ms^{-1}

Answer

12. A rocket of initial mass 1000 kg ejects mass at a constant rate of 10 kg/s with constant relative speed of 11 ms^{-1} . Neglecting gravity, the acceleration of the rocket 1 min after the blast is
- A. $11/40 \text{ ms}^{-2}$
B. $22/40 \text{ ms}^{-2}$
C. $1.1/40 \text{ ms}^{-2}$
D. 1 ms^{-2}

Answer

13. An elastic ball is dropped from a height h and it rebounds many times from the floor. If the coefficient of restitution is e , the time interval between the second and the third impact, is
- A. ev/g
B. e^2v/g
C. $e28hg$
D. $e2 hg$

Answer

14. An object of mass m is attached to light string which passess through a hollow tube. The object is set into rotation in a horizontal circle of radius, r_1 . If the string is pulled shortening the radius to r_2 , the ratio of new kinetic energy to the original kinetic energy is
- A. r_2r_{12}
B. r_1r_{22}
C. r_1r_2
D. r_2r_1

Answer

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15. Total angular momentum of a rotating body remains constant, if the net torque acting on the body is

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A. Zero

B. maximum

C. minimum

D. unity

Answer

16. A car is racing on a circular track of 180 m radius with a speed of 32 ms^{-1} . What should be the banking angle of the road to avoid changes of skidding of the Vehicle at this speed without taking into consideration the friction between the tyre and the road ?

A. 45°

B. 60°

C. 30°

D. 15°

Answer

17. When a ceiling fan is switched on it makes 10 rotations in the first 3s. The number of rotations it makes in the next 3 s, assuming uniform angular acceleration is

A. 40

B. 30

C. 20

D. 10

Answer

18. A body is projected vertically upwards from the surface of a planet of radius r with a velocity equal to $1/3$ rd the escape velocity for that planet. The maximum height attained by the body is

A. $R/2$

B. $R/3$

C. $R/9$

D. $R/8$

Answer

19. A man weighs 80 kg on earth surface. The height above ground where he will weigh 40 kg, is : (radius of earth is 6400 km)

A. 0.31 times r

B. 0.41 times r

C. 0.51 times r

D. 0.61 times r

Answer

20. A solid sphere and a hollow sphere, both of the same size and same mass roll down an inclined plane. Then

A. solid sphere reaches the ground first

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B. the lower sphere reaches the ground first

C. both spheres reach the ground at the same time

D. the time at which the spheres reach the ground cannot be specified by the given data

Answer

21. Three point charges 1 C, 2C and 3C are placed at the corners of an equilateral triangle of side 1 m. The work done in bringing these charges to the vertices of a smaller similar triangle of side 0.5 m is

- A. 2.7×10^{10} J
- B. 9.9×10^{10} J
- C. 10.8×10^{10} J
- D. 5.4×10^{10} J

Answer

22. In a simple pendulum the breaking strength of the string is double the weight of the bob. The bob is released from rest when the string is horizontal. The string breaks when it makes an angle θ with the vertical. Then

- A. $\theta = 30^\circ$
- B. $\theta = 45^\circ$
- C. $\theta = \cos^{-1} (2/3)$
- D. $\theta = \cos^{-1} (1/3)$

Answer

23. An object of mass m falls on to a spring of constant k from h . Then the spring undergoes compression by a length a . The maximum compression x is given by the equation

- A. $mgh = 12 kx^2$
- B. $mg h + x = 12 kx^2$
- C. $mg h + x = - kx$
- D. $mgh = - kx$

Answer

24. An adulterated sample of milk has a density of 1032 kgm^{-3} , while pure milk has a density of 1080 kgm^{-3} . Then the volume of pure milk in a sample of 10 L of adulterated milk is

- A. 0.5 L
- B. 1.0 L
- C. 4.0 L
- D. 3.0 L

Answer

25. Typical silt (hard mud) particle of radius $20 \mu\text{m}$ is on the top of lake water, its density is 2000 kg/m^3 and the viscosity of lake water is 1.0 mPa , density is 1000 kg/m^3 . If the lake is still (has no internal fluid motion). The terminal speed with which the particle hits the bottom of the lake

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A. 0.67 mm/s

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B. 0.77 mm/s

C. 0.87 mm/s

D. 0.97 mm/s

Answer

26. If P is the pressure, V the volume, R the gas constant, k the Boltzmann constant and T the absolute temperature, then the number of molecules in the given mass of the gas is given by

A. $PVRT$

B. $PVKT$

C. PRT

D. pV

Answer

27. An air bubble is released from the bottom of a pond and is found to expand to thrice its original volume as it reached the surface. If the atmospheric pressure is 100 kPa, the absolute pressure at the bottom of lake in kPa is (assume no temperature variation):

A. 33.3

B. 50.0

C. 300.0

D. 200.0

Answer

28. During an adiabatic process, the volume of a gas is found to be proportional to the cube of its absolute temperature. The ratio C_p / C_v for the gas is

A. $5/3$

B. $4/3$

C. $3/2$

D. $5/4$

Answer

29. 1 g of steam at 100°C and equal mass of ice at 0°C are mixed. The temperature of the mixture in steady state will be (latent heat of steam = 540 cal/g, latent heat of ice = 80 cal/g)

A. 50°C

B. 100°C

C. 67°C

D. 33°C

Answer

30. The work done by a gas is maximum when it expands

A. isothermally

B. adiabatically

C. isentropically

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Answer

31. A tuning fork of frequency 580 Hz is employed to produce transverse waves on a long rope. The distance between the nearest crests is found to be 20 cm. The velocity of the wave is

- A. 58 ms^{-1}
- B. 580 ms^{-1}
- C. 116 ms^{-1}
- D. 29 ms^{-1}

Answer

32. A heavy brass sphere is hung from a weightless inelastic spring and as a simple pendulum its time period of oscillation is T . When the sphere is immersed in a non-viscous liquid of density $1/10$ that of brass, it will act as a simple pendulum of period

- A. T
- B. $109 T$
- C. $910 T$
- D. $109 T$

Answer

33. The distance travelled by a sound wave when a tuning fork completes 25 vib in 16.5 m. If the frequency of the tuning fork is 500 Hz, find the velocity of sound.

- A. 350 ms^{-1}
- B. 330 ms^{-1}
- C. 300 ms^{-1}
- D. 450 ms^{-1}

Answer

34. Two instruments having stretched strings are being played in unison. When the tension of one of the instruments is increased by 1 %, 3 beats are produced in 2s. The initial frequency of vibration of each wire is

- A. 300 Hz
- B. 500 Hz
- C. 1000 Hz
- D. 400 Hz

Answer

35. The capacitors A and B have identical geometry. A material with a dielectric constant 3 is present between the plates of B. The potential difference across A and B are respectively

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- A. 2.5 V, 7.5 V
- B. 2 V, 8 V
- C. 8 V, 2 V
- D. 7.5 V, 2.5 V

Answer

36. An electric bulb is marked 100 W, 230 V. If the supply voltage drops to 115 V, what is the total energy produced by the bulb in 10 min ?

- A. 30 kJ
- B. 20 kJ
- C. 15 kJ
- D. 10 kJ

Answer

37. A circular coil carrying a current has a radius R. The ratio of magnetic induction at the centre of the coil and at a distance equal to 3R from the centre of the coil on the axis is

- A. 1 : 1
- B. 1 : 2
- C. 8 : 1
- D. 1 : 8

Answer

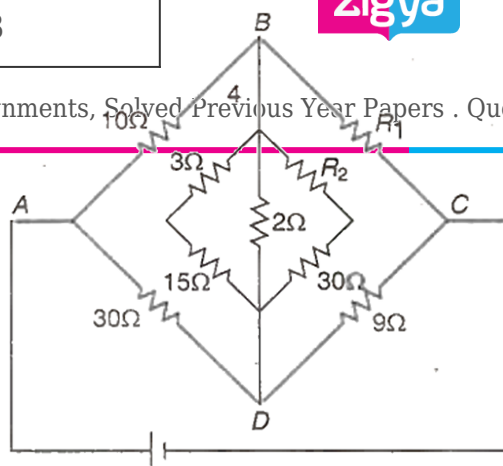
38. The examples of diamagnetic, paramagnetic and ferromagnetic materials are respectively

- A. copper, aluminium, iron
- B. aluminium, copper, iron
- C. copper, iron, aluminium
- D. aluminium, iron, copper

Answer

39. In the Wheatstone's bridge shown below, in order to balance the bridge we must have

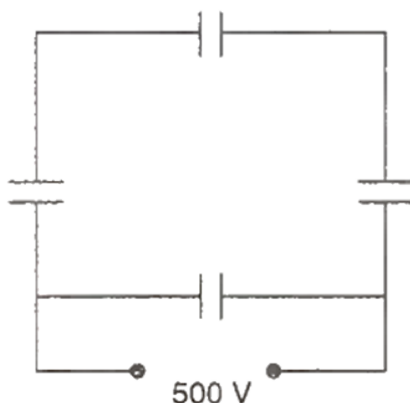
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- A. $R_1 = 3 \Omega$, $R_2 = 3 \Omega$
- B. $R_1 = 6 \Omega$, $R_2 = 1.5 \Omega$
- C. $R_1 = 1.5 \Omega$, $R_2 = \text{any finite value}$
- D. $R_1 = 3 \Omega$, $R_2 = \text{any finite value}$

Answer

40. Four 10 F capacitors are connected to a 500 V supply as shown in the figure. The equivalent capacitance of the network is



- A. $40 \mu\text{F}$
- B. $20 \mu\text{F}$
- C. $13.3 \mu\text{F}$
- D. $10 \mu\text{F}$

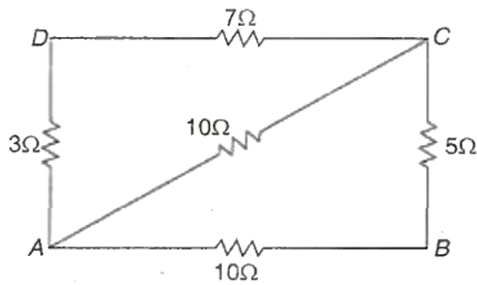
Answer

41. A resistor is constructed as hollow cylinder of dimensions $r_a = 0.5 \text{ cm}$ and $r_b = 1.0 \text{ cm}$ and $\rho = 3.5 \times 10^{-5} \Omega\text{m}$. The resistance of the configuration for the length of 5 cm cylinder is

- A. $7.42 \times 10^{-3} \Omega$
- B. $10.56 \times 10^{-3} \Omega$
- C. $14.38 \times 10^{-3} \Omega$
- D. $16.48 \times 10^{-3} \Omega$

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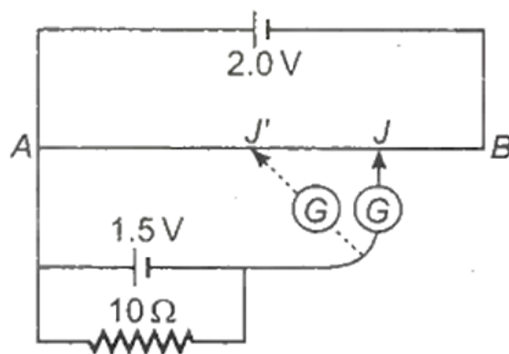
42. The resistances are connected as shown in the figure below. Find the equivalent resistance between the points A and B.



- A. 205 Ω
- B. 10 Ω
- C. 3.5 Ω
- D. 5 Ω

Answer

43. The figure below shows a 2.0 V potentiometer used for the determination of internal resistance of a 2.5 V cell. The balance point of the cell in the open circuit is 75 cm. When a resistor of 10 Ω is used in the external circuit of the cell, the balance point shifts to 65 cm length of potentiometer wire. Then the internal resistance of the cell is



- A. 2.5 Ω
- B. 2.0 Ω
- C. 1.54 Ω
- D. 1.0 Ω

Answer

44. An electric heater boils 1 kg of water in a time t_1 . Another heater boils the same amount of water in a time t_2 . When the two heaters are connected in parallel, the time required by them together to boil the same amount of water is

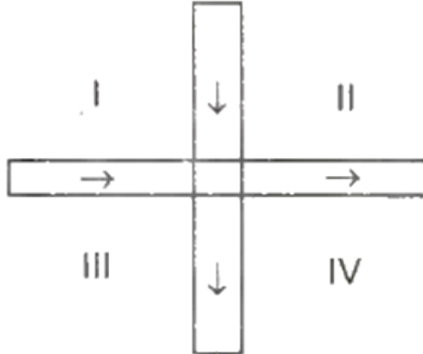
- A. $t_1 + t_2$
- B. $t_1 t_2$

C. $t_1 t_2 t_1 + t_2$

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Answer

45. Two thin metallic strips, carrying current in the direction shown, cross each other perpendicularly without touching but being close to each other, as shown in the figure. The regions which contain some points of zero magnetic induction are



- A. I and II
- B. I and III
- C. I and IV
- D. II and III

Answer

46. The force on a conductor of length l placed in a magnetic field of magnitude B and carrying a current I is given by (θ is the angle, the conductor makes with the direction of B)
- A. $F = I l B \sin \theta$
 - B. $F = I^2 l B^2 \sin \theta$
 - C. $F = I l B \cos \theta$
 - D. $F = I l B \sin \theta$

Answer

47. A needle made of bismuth is suspended freely in a magnetic field. The angle which the needle makes with the magnetic field is
- A. 0°
 - B. 45°
 - C. 90°
 - D. 180°

Answer

48. The resonant frequency of an LCR circuit occurs at a frequency equal to
- A. $1/LC$
 - B. $1/LC$
 - C. $1/LCR$
 - D. $1/CR$

Answer

49. An AC is given by $i = i_0 \cos \omega t + i_0 \sin \omega t$. The rms current is given by

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B. i1 - i22

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D. i12 - i222

Answer

50. The coefficient of mutual inductance between the primary and secondary of the coil is 5 H. A current of 10 A is cut off in 0.5 s. The induced emf is
- A. 1 V
 - B. 10 V
 - C. 5 V
 - D. 100 V

Answer

51. If a transformer of an audio amplifier has output impedance $8000\ \Omega$ and the speaker has input impedance of $8\ \Omega$, the primary and secondary turns of this transformer connected between the output of amplifier and to loud speaker should have the ratio
- A. 1000 : 1
 - B. 100 : 1
 - C. 1 : 32
 - D. 32 : 1

Answer

52. In the electromagnetic spectrum, the visible spectrum lies between
- A. radiowaves and microwaves
 - B. infrared and ultraviolet rays
 - C. microwaves and infrared spectrum
 - D. X-ray and γ -ray spectrum

Answer

53. Maxwell in his famous equation of electromagnetism introduced the concept
- A. AC current
 - B. DC current
 - C. displacement current
 - D. impedance

Answer

54. Out of the following electromagnetic radiations, which has the shortest wavelength ?
- A. Radiowaves
 - B. Infrared
 - C. X-rays
 - D. Visible light

Answer

55. A charged oil drop of mass $9.75 \times 10^{-15}\text{ kg}$ and charge $30 \times 10^{-16}\text{ C}$ is suspended in a uniform electric field. Like. Share. Bookmark. Download. Make Notes. Print - Your Favourite Questions. Join www.zigya.com

ms^{-2}) is

electric field existing between two parallel plates. The field between the plates is 300 V/m (g = 10)

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A. 3.25 V/m

B. 300 V/m

C. 325 V/m

D. 32.5 V/m

Answer

56. In Young's double slit experiment, the width of one of the slits is slowly increased to make it twice the width of the other slit. Then in the interference pattern

A. the intensity of maxima increase while that of minima decrease

B. the intensities of both maxima and minima decrease

C. the intensities of both maxima and minima increase

D. the intensity of maxima decrease while that of minima increase

Answer

57. Two coherent sources whose intensity ratio is $81 : 1$ produce interference fringes. The ratio of minimum to maximum intensity, i.e. $I_{\min} : I_{\max}$ is

A. $16 : 25$

B. $9 : 1$

C. $1 : 9$

D. $25 : 16$

Answer

58. An infinitely long rod lies along the axis of concave mirror of focal length f . The near end of the rod is at a distance $x > f$ from the mirror. Then the length of the image of the rod is

A. $f2x + f$

B. $f2x$

C. $f2x - f$

D. $xfx + f$

Answer

59. A beaker containing a liquid appears to be half when it is actually two third full. The refractive index of liquid is

A. $7/6$

B. $6/5$

C. $4/3$

D. $5/4$

Answer

60. If h_1 and h_2 are the heights of the images in conjugate position of a convex lens, then the height of the object is

A. $h_1 + h_2$

B. $h_1 - h_2$

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D. $h\nu/2$

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Answer

61. The power of the combination of a convex lens of focal length 50 cm and concave lens of focal length 40 cm is
- + 1 D
 - 1 D
 - 0.5 D
 - + 0.5 D

Answer

62. Image formed by a convex lens is virtual and erect when the object is placed
- at F
 - between F and the lens
 - at 2 F
 - beyond 2 F

Answer

63. The rest mass of photon is
- $h\nu c$
 - $h\nu c^2$
 - $hc\lambda$
 - zero

Answer

64. If the wavelength of incident light changes from 400 nm to 300 nm, the stopping potential for photoelectrons emitted from a surface becomes approximately
- 1.0 V greater
 - 1.0 V smaller
 - 0.5 V greater
 - 0.5 V smaller

Answer

65. Let the potential energy of hydrogen atom in the ground state be regarded as zero. Then its potential energy in the first excited state will be
- 20.4 eV
 - 13.6 eV
 - 10.2 eV
 - 6.8 eV

Answer

66. Two radioactive nuclides x and y have half-lives 1 h and 2 h respectively. Initially the samples have equal number of nuclei. After 4 h the ratio of the numbers of x and y is
- 12

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C. 14

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Answer

67. ${}_{92}\text{U}^{238}$ decays successively to form ${}_{90}\text{Th}^{234}$, ${}_{91}\text{Pa}^{234}$, ${}_{92}\text{U}^{234}$, ${}_{90}\text{Th}^{230}$, ${}_{88}\text{Ra}^{226}$ then during the reaction the number of α -particles emitted is
- 4
 - 3
 - 5
 - 2

Answer

68. Let n_e and n_h represent the number density of electrons and holes in a semiconductor. Then
- $n_e > n_h$ if the semiconductor is intrinsic
 - $n_e < n_h$ if the semiconductor is intrinsic
 - $n_e \neq n_h$, if the semiconductor is intrinsic
 - $n_e = n_h$, if the semiconductor is intrinsic

Answer

69. In a n-p-n transistor amplifier, the collector current is 9 mA. If 90% of the electrons from the emitter reach the collector, then
- $\alpha = 0.9$, $\beta = 9.0$
 - the base current is 10 mA
 - the emitter current is 1 mA
 - $\alpha = 9.0$, $\beta = 0.9$

Answer

70. In a properly biased transistor
- both depletion layers are equally large
 - both depletion layers are equally small
 - emitter-base depletion layer is large but base-collector depletion layer is small
 - emitter-base depletion layer is small but base-collector depletion layer is large.

Answer

71. A dim star of magnitude + 14.5 explodes into a nova of magnitude + 2. The factor by which the brightness of the star has increased is
- 12.5
 - 10^2
 - 10^5
 - 10^4

Answer

72. If the sun becomes twice as hot
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A. the output of radiated energy will be eight times larger

B. it will radiate predominantly in the infrared

C. It will radiate predominantly in the ultraviolet

D. the output of the radiated energy will be eight times smaller

Answer