PHYSICS

BOOKS - MTG PHYSICS (BENGALI ENGLISH)

QUESTION PAPER 2007

Physics

1. The coefficient of volume expansion of a liquid is γ and its density at $0^\circ C$ is ρ. If the

temperature is increased to $t°C$ then the change in density will be

A. $\dfrac{\rho(1 + vt)}{vt}$

B. $-\dfrac{\rho(1 + vt)}{vt}$

C. $\dfrac{\rho vt}{1 + vt}$

D. $-\dfrac{\rho vt}{1 + vt}$

Answer:

2. If the absolute temperature of a closed volume of gas is doubled, the mean free path of the molecules will be

    A. halved

    B. doubled

    C. unchanged

    D. decreased by a factor $\sqrt{2}$

Answer:

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3. Which of the following is a no magnetic substance?

A. a) Steel

B. b) Nickel

C. c) Brass

D. d) Iron

Answer:

4. When a minute quantity of phosphorus is added to a silicon crystal the latter becomes

A. good conductor

B. p-type semiconductor

C. good insulator

D. n-type semiconductor

Answer:

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5. If a logic gate has both inputs at logic level 1 and output at logic level 0, then it is a

A. NOT gate

B. NAND gate

C. AND gate

D. OR gate

Answer:

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6. When a wave travelling from one medium is refracted into other medium, which of the following will not change?

A. Wavelength

B. Amplitude

C. Frequency

D. Velocity

Answer:

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7. An example of a rechargeable cell is

      A. Lead acid battery

      B. Daniel cell

      C. Leclanche cell

      D. Dry battery

Answer:

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8. The output form of a full wave rectifier with a L-C filter is

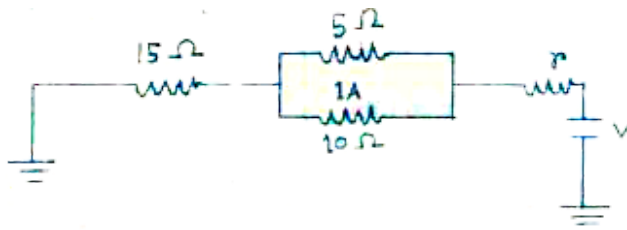A. a d.c voltage

B. zero voltage

C. a pulsating unidirectional voltage

D. an a.c. voltage

Answer:

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9.

In the circuit shown above the current

through the 15Ω resistance is

    A. 15A

    B. 3A

    C. 5A

    D. 1A

Answer:

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10. Pitch of a screw gauze instrument is 0.5 mm and its circular scale is divided into 100 divisions. The least count of the instrument will be

A. 0.005 mm

B. 0.05 mm

C. 0.0005m

D. 0.50 mm

Answer:

11. A sealed spherical ball half filled with a volatile liquid is used as the bob of a pendulum executig simple harmonic motion with period T_1. The bob is heated slightly so that the liquid evaporates completely and the period is now found to be T_2. Which one of the following is true?

A. $T_2 > T_1$

B. $T_2 = T_1$

C. $T_2 < T_1$

D. Any relation between T_2 and T_1 cannot

be ascertained from the data given

Answer:

12. Four capacitors of equal capacitance have a

net capacitance C_1 when connected in series

and a net capacitance C_2 when connected in

parallel. The ratio of C_1 / C_2 is

A. $\dfrac{1}{4}$

B. $\dfrac{1}{16}$

C. $\dfrac{1}{8}$

D. $\dfrac{1}{12}$

Answer:

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13. Two conherent monochromatic lights make constructive interference when their phase difference is

A. a) $\dfrac{3}{2}\pi$

B. b) 2π

C. c) π

D. d) $\dfrac{\pi}{2}$

Answer:

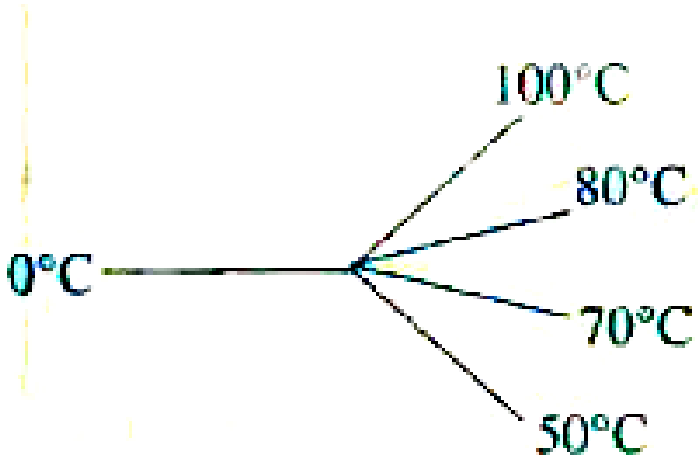▶ **Watch Video Solution**

14. Five metallic rods of same length and same material are connected as shown in the figure. One end of each is kept at temperatures

$100°C$, $80°C$, $70°C$, $50°C$ and $0°C$ as shown respectively. The temperature at the junction of the five rods is

A. $70°C$

B. $60°C$

C. $75°C$

D. $40^\circ C$

Answer:

15. A beam of charged particles, having been accelerated by a voltage V, has a wavelength λ. On increasing the accelerating voltage to 4V, the wavelength will become

A. 2λ

B. $\lambda/2$

C. 4λ

D. remain the same

Answer:

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16. A coil having n number of turns and area A is placed in a magnetic field B so that its axis makes an angles $60°$ with the direction of B.If

B changes with time, the magnitude of the emf induced in the coil will be

A. $nA\dfrac{dB}{dt}$

B. $\dfrac{1}{2}\dfrac{A}{n}\dfrac{dB}{dt}$

C. $\dfrac{1}{2}nA\dfrac{dB}{dt}$

D. $\dfrac{1}{3}\dfrac{A}{n}\dfrac{dB}{dt}$

Answer:

17. An ideal gas undergoing adiabatic expansion obeys the relations

A. $pV = RT$

B. $pV^{\gamma} = \text{const}$

C. $\left(p + \dfrac{a}{V^2}\right)(V - b) = RT$

D. $pV^{\gamma - 1} = \text{const}$

Answer:

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18. A man weighing 90 kg acquires 10^5 cal of heat from food. The height he can climb by its expense it his metabolic efficiency is 28% is

A. 1333m

B. 133.3m

C. 13.33m

D. 1.333m

Answer:

19. Which of the following devices is used for detecting thermal radiations?

    A. Thermopile

    B. Liquid thermometer

    C. Platinum resistance thermometer

    D. Constant volume thermometer

Answer:

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20. Energy corresponding to a photon of wavelength 5700Å is

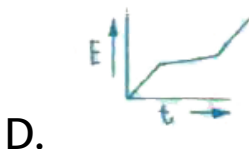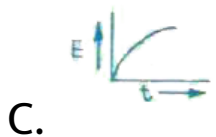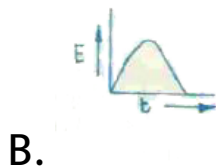   A. 21.7 eV
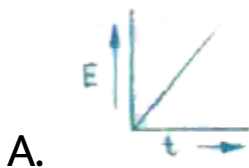
    B. 2.17 eV

    C. 8.34eV

    D. 16.68eV

Answer:

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21. Which of the following graphs represent variations of thermo emf (E) of a thermocouple with temperature t of the junction, the cold junction being kept at $0°C$?

A.

B.

C.

D.

Answer:

22. 1 gm of water ($= 1cm^3$) when boiled at 1 atmosphere pressure, requires 169 J of energy to get converted into steam. Which of the following gives the volume of the converted steam if latent heat of vaporization of water is 540 cal/gm?

A. $1560cm^3$

B. $1669 cm^3$

C. $1572 cm^3$

D. $1600 cm^3$

Answer:

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23. A wire loop of area A is placed in a uniform magnetic field B so that the directio of B is parallel to the plane of the coil. If B changes with time the emf induced in the loop will be

A. $A\dfrac{dB}{dt}$

B. $-A\dfrac{dB}{dt}$

C. zero

D. $\dfrac{1}{3}A\dfrac{dB}{dt}$

Answer:

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24. The source of unlimited thermal energy of stars is due to

A. nuclear fission

B. photo disintegration

C. nuclear fusion

D. γ-ray disintegration

Answer:

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25. At a certain place, the horizontal component of earth's magnetic field is $\sqrt{3}$

times the vertical component. Then the angle of dip at that place is

A. $30°$

B. $45°$

C. $60°$

D. $75°$

Answer:

26. A train moving with a velocity v is passing a station. A passenger standing on the station notices that the whistle emitted by the train changes its frequency by 50 Hz when it passes him. Given that the frequency of the whistle when the train is at rest with respect to the passenger is 500 Hz and the velocity of sound in air is 330 m/sec, the velocity of the train is

    A. 8.25 m/sec

    B. 17.5 m/sec

    C. 35 m/sec

D. 30 m/sec

Answer:

27. The dimension of the coefficient of viscosity is

A. $M^1 L^{-1} T^{-1}$

B. $M^0 L^{-} T^{-1}$

C. MLT^{-2}

D. ML^2T^{-2}

Answer:

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28. If the displacement of a particle changes with time as $\sqrt{x} = t + 3$, then the velocity of the particle will be proportional to

A. t^{-1}

B. t

C. $\sqrt{t}$

D. t^{-2}

Answer:

29. A rain drop of radius R falls from a height of H metre above the ground. The work done by the gravitational force is proportional to which one of the following?

A. R^2

B. R^3

C. R

D. $R^{1/2}$

Answer:

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30. Which of the following heat transfer processes is/are necessary so that a candle may continue to burn?

A. Conduction

B. Conduction and convection

C. Radiation

D. Convection

Answer:

31. If the displacement (X) of the medium in the x-direction at a point x due to a wave is given by

$$X(x, t) = A \cos(kx - wt) + A \cos(kx + wt)$$

, then the wave isa

A. longitudinal progressive wave

B. longitudinal stationary wave

C. transverse progressive wave

D. transverse stationary wave

Answer:

32. Which of the following equations is Einstein's equation related to photoelectric effect?

A. $hv = \dfrac{1}{2}mv^2 - W$

B. $hv = \dfrac{1}{2}mv^2 + W$

C. $hv = W - \dfrac{1}{2}mv^2$

D. $hv = mv - hv$

Answer:

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33. An object of mass m is projected at an angle $60°$ (with horizontal axis) with a velocity v.Its kinetic energy at the peak of the trajectory is

A. $\dfrac{mv^2}{2}$

B. $\dfrac{mv^2}{8}$

C. $2mv^2$

D. $\dfrac{mv^2}{4}$

Answer:

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34. The temperature at which the r.m.s velocity of constituent gas particle at $0°C$ decreases to half is

    A. $0°C$

    B. $-273°C$

    C. $32°C$

    D. $-204°C$

Answer:

35. A body is floating partially immersed in a liquid. If the body and the liquid are taken to the moon the body will

A. continue to float exactly as in the earth

B. float with a larger part immersed in the liquid

C. float with a smaller part immersed in the liquid

D. sink

Answer:

36. 300 grams of water at $80°C$ are poured on a large block of ice at $0°C$. The mass of ice that melts is

A. 80 gm

B. 30 gm

C. 800 gm

D. 300 gm

Answer:

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37. If three bulbs of ratings 60W, 75W and 100 W are connected to 220 v mains in series, then which bulb will burn most brightly?

A. 75 W bulb

B. 60 W bulb

C. 100 W bulb

D. All bulbs will burn with equal brightness

Answer:

38. The current through a semiconductor is carried by

A. electrons

B. electrons and holes

C. holes

D. positive ions

Answer:

39. An alternating voltage (E) varies with time (t) in a circuit which is given by $E = 200 \sin\left(100\pi t - \dfrac{\pi}{20}\right)$ volt. The R.M.S value of the voltage is

A. $\dfrac{200}{1.414}$ volt

B. 200 (1.414) volt

C. 200 volt

D. $200\sqrt{1.414}$ volt

Answer:

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40. The temeprature of a star can be determined using

A. Stefan's law

B. Wien's law

C. Kirchoff's law

D. Plank's law

Answer:

41. The average rise in temperature produced in a resistance carrying a time varying current depends on its

A. RMS value

B. peak value

C. average value

D. DC value

Answer:

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42. The work done in carrying a charge q once round a circle of radius r with a charge q^1 at the centre is

A. zero

B. $\dfrac{qq^1}{4\pi\varepsilon_0}\left(\dfrac{1}{\pi r}\right)$

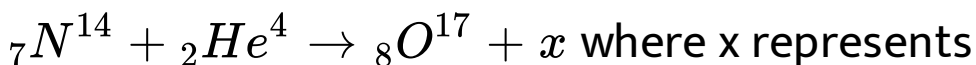C. $\dfrac{qq^1}{4\pi\varepsilon_0}\left(\dfrac{1}{2\pi r}\right)$

D. $\dfrac{qq^1}{4\pi\varepsilon_0 r}$

Answer:

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43. A nuclear reaction is given by

$_7N^{14} + {}_2He^4 \rightarrow {}_8O^{17} + x$ where x represents

A. neutron

B. proton

C. electron

D. positron

Answer:

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44. Which of the following is a vector

quantity?

A. Temperature

B. Flux density

C. Magnetic field intensity

D. Time

Answer:

45. Total internal reflection takes place when light moves from a medium P to a medium Q

where P & Q have the following characteristics?

A. light has a lower velocity in P than in Q

B. light has a higher frequency in P than in Q

C. light has a higher wavelength in P than in Q

D. light has a lower frequency in P than in Q

Answer:

46. Two wires of same material have length L and L/2 and radius r and r/2 respectively. The ratio of their Young's modulus is

A. $1:2$

B. $1:1$

C. $2:1$

D. $4:1$

Answer:

47. A cyclist is moving along a curvature of radius r at a constant speed v. The angle made by the cyclist with the vertical plane is

A. $\tan^{-1}\left(\dfrac{v^2}{rg}\right)$

B. $\tan^{-1}\left(\dfrac{rg}{v^2}\right)$

C. $\tan^{-1}\left(\dfrac{v^2 r}{g}\right)$

D. $\tan^{-1}\left(\dfrac{r}{v^2 g}\right)$

Answer:

48. Slope of an isothermal curve is always

A. equal to adiabatic curve

B. greater than adiabatic curve

C. less than adiabatic curve

D. canot be determined

Answer:

49. The objective of a compound microscope whose magnifying power is 100, produces a magnification 5. The magnification produced by the eye- piece is

A. 40

B. 30

C. 20

D. 10

Answer:

50. A rod of length l, Young's modulus Y and linear thermal expansion coefficient α is heated to a temperature T above room temp. and its are fixed by two clamps. On cooling to room temperature it will develop

A. stress $Y\alpha T$

B. no stress

C. strain $2\alpha T$

D. no strain

Answer:

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