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Previous Year Paper

Physics - 2015

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Multiple Choice Questions

1. The physical quantity that does not have the dimensional formula $[ML^{-1}T^{-2}]$ is

- A. force
- B. pressure
- C. stress
- D. modulus of elasticity

Answer

2. A force F is applied onto a square plate of side L . If the percentage error in determining L is 2 % and that in F is 4 %, the permissible percentage error in determining the pressure is

- A. 2 %
- B. 4 %
- C. 6 %
- D. 8 %

Answer

3. From a balloon moving upwards with a velocity of 12 ms^{-1} , a packet is released when it is at a height of 65 m from the ground. The time taken by it to reach the ground is (take, $g = 10 \text{ ms}^{-2}$)

- A. 5 s
- B. 8 s
- C. 4 s
- D. 7 s

Answer

4. A bus is moving with a velocity of 10 ms^{-1} on a straight road. A scooterist wishes to overtake the bus in one minute. If the bus is at a distance of 1.2 km ahead, then the velocity with which he has to chase the bus is

- A. 20 ms^{-1}
- B. 25 ms^{-1}
- C. 30 ms^{-1}
- D. 40 ms^{-1}

Answer

5. If the displacement of a body varies as the square of elapsed time, then its

- A. velocity is constant

- B. velocity varies non-uniformly

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C. acceleration is constant
D. acceleration changes continuously

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6. The magnitudes of a set of 3 vectors are given below. The set of vectors for which the resultant cannot be zero is

- A. 15, 20, 30
- B. 20, 20, 30
- C. 10, 20, 40
- D. 10, 10, 20

Answer

7. A ball dropped from a point A falls down vertically to C, through the mid-point B. The descending time from A to B and that from A to C are in the ratio

- A. 1 : 1
- B. 1 : 2
- C. 1 : 3
- D. 1 : 2

Answer

8. A cricket ball is hit at an angle of 30° to the horizontal with a kinetic energy E. Its kinetic energy when it reaches the highest point is

- A. E/2
- B. 0
- C. 2E/3
- D. 3E/4

Answer

9. If n bullets each of mass m are fired with a velocity v per second from a machine gun, the force required to hold the gun in position is

- A. $(n + 1) mv$
- B. mvn^2
- C. mnv
- D. n^2mv

Answer

10. The time required to stop a car of mass 800 kg, moving at a speed of 20ms^{-1} over a distance of 25 m is

- A. 2 s
- B. 2.5 s
- C. 4 s
- D. 4.5 s

Answer

11. A car moves at a speed of 20ms^{-1} on a banked track and describes an arc of a circle of radius 100 m. The angle of banking is

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A. 25°

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B. 60° C. 45° D. 30°

Answer

12. When a body is projected vertically up from the ground with certain velocity, its potential energy and kinetic energy at a point A are in the ratio 2 : 3. If the same body is projected with double the previous velocity, then at the same point A the ratio of its potential energy to kinetic energy is

A. 9 : 1

B. 2 : 9

C. 1 : 9

D. 9 : 2

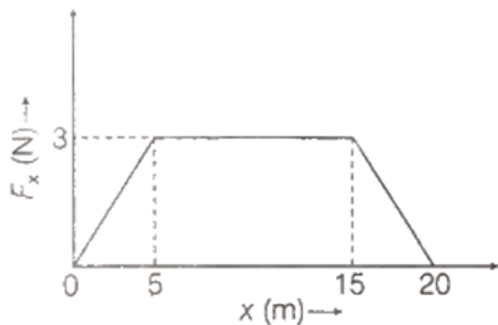
Answer

13. A spring with force constant k is initially stretched by x_1 . If it is further stretched by x_2 , then the increase in its potential energy is

A. $12k (x_2 - x_1)^2$ B. $12 k x_2 (x_2 + 2 x_1)$ C. $12 k x_1^2 + 12 k x_2^2$ D. $12 k (x_1 + x_2)^2$

Answer

14. A force F_x acts on a particle such that its position x changes as shown in the figure.



The work done by the particle as it moves from $x = 0$ to 20 m is

A. 37.5 J

B. 10 J

C. 45 J

D. 22.5 J

Answer

15. Two objects P and Q initially at rest move towards each other under mutual force of attraction. At the instant when the velocity of P is v and that of Q is $2v$, the velocity of centre of mass of the

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B. $3v$

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C. Zero

D. $1.5 v$

Answer

16. A body rolls down an inclined plane . If its kinetic energy of rotation is 40% of its kinetic energy of translation motion, then the body is
- A. hollow cylinder
 - B. ring
 - C. solid disc
 - D. solid sphere

Answer

17. A circular disc A and a ring B have same mass and same radius. If they are rotated with the same angular speed about their own axis, then
- A. A has less moment of inertia than B
 - B. A has less rotational kinetic energy than B
 - C. A and B have the same angular momentum
 - D. A has greater angular momentum than B

Answer

18. Angular momentum of the Earth revolving around the Sun in a circular orbit of radius R is proportional to
- A. R
 - B. R
 - C. R^2
 - D. $R^{1/3}$

Answer

19. A body of mass m is released from a height equal to the radius R of the Earth. The velocity with which it will strike the Earth's surface is
- A. $2gR$
 - B. gR
 - C. $2 mgR$
 - D. mgR

Answer

20. A satellite revolves around the Earth of radius R in a circular orbit of radius 3R. The percentage increase in energy required to lift it to an orbit of radius 5R is
- A. 10 %
 - B. 20 %
 - C. 30 %

D. 40 %

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21. When two springs A and B with force constants k_A and k_B are stretched by the same force, then the respective ratio of the work done on them is

- A. $k_B : k_A$
- B. $k_A : k_B$
- C. $k_A : k_B : 1$
- D. $k_B : k_A$

Answer

22. For a particle moving according to the equation $x = a \cos \pi t$, the displacement in 3 s is

- A. 0
- B. $0.5 a$
- C. $1.5 a$
- D. $2 a$

Answer

23. Two capillary tubes A and B of diameter 1 mm and 2 mm respectively are dipped vertically in a liquid. If the capillary rise in A is 6 cm, then the capillary rise in B is

- A. 2 cm
- B. 3 cm
- C. 4 cm
- D. 6 cm

Answer

24. Two wires A and B of same material and of equal length with the radii in the ratio 1 : 2 are subjected to identical loads. If the length of A increases by 8 mm, then the increase in length of B is

- A. 2 mm
- B. 4 mm
- C. 8 mm
- D. 16 mm

Answer

25. After terminal velocity is reached, the acceleration of a body falling through a fluid is

- A. equal to g
- B. zero
- C. less than g
- D. greater than g

Answer

26. A liquid is filled upto a height of 20 cm in a cylindrical vessel. The speed of liquid coming out of a small hole at the bottom of the vessel is (take, $g = 10 \text{ ms}^{-2}$)

- A. 1.2 ms^{-1}

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D. 3.2 ms^{-1}

Answer

27. A metallic bar of coefficient of linear expansion 10^{-5} K^{-1} is heated from 0°C to 100°C . The percentage increase in its length is
- 0.1 %
 - 1 %
 - 10 %
 - 0.01 %

Answer

28. Two perfectly black spheres A and B having radii 8 cm and 2 cm are maintained at temperatures 127°C and 527°C , respectively. The ratio of the energy radiated by A to that by B is
- 1 : 2
 - 1 : 1
 - 2 : 1
 - 1 : 4

Answer

29. For a monoatomic gas, the molar specific heat at constant pressure divided by the molar gas constant R is equal to
- 2.5
 - 1.5
 - 5.0
 - 3.5

Answer

30. Hot water in a vessel kept in a room cools from 70°C to 65°C in t_1 minutes, from 65°C to 60°C in t_2 minutes and from 60°C to 55°C in t_3 minutes then,
- $t_1 < t_2 > t_3$
 - $t_1 = t_2 = t_3$
 - $t_1 < t_2 < t_3$
 - $t_1 < t_2 = t_3$

Answer

31. Two oscillating simple pendulums with time periods T and 5T are in phase at a given time. They are again in phase after an elapse of time
- 4 T
 - 3 T
 - 6 T
 - 5 T

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32. A wave of frequency 500 Hz travels with a speed of 360 ms^{-1} . The distance between two nearest points which are 60° out of phase is

A. 12 cm
B. 18 cm
C. 50 cm
D. 24 cm

Answer

33. The apparent frequency observed by a moving observer away from a stationary source is 20% less than the actual frequency. If the velocity of sound in air is 330 ms^{-1} , then the velocity of the observer is

A. 660 ms^{-1}
B. 330 ms^{-1}
C. 66 ms^{-1}
D. 33 ms^{-1}

Answer

34. A string under tension of 129.6 N produces 10 beats/second, when it vibrates along with a tuning fork. When the tension in the string is increased to 160 N, it vibrates in unison with the tuning fork. Then, frequency of the tuning fork is

A. 100 Hz
B. 110 Hz
C. 90 Hz
D. 220 Hz

Answer

35. An electric dipole of moment μ of $400 \mu\text{C m}$ is placed in a transverse electric field (E) of 50 Vm^{-1} at an angle of 30° to E. Then, a torque of

A. 10^{-2} Nm acts along the direction E
B. 10^{-3} Nm acts along the direction μ
C. 10^{-2} Nm acts normal to both E and μ
D. 10^{-3} Nm acts along the direction E

Answer

36. A charge Q is distributed over two concentric hollow spheres of radii a and b $a > b$, so that the surface charge densities are equal. The potential at the common centre is $14\pi\epsilon_0$ times.

A. $Q a + b a^2 + b^2$
B. $2Q a + b a^2 + b^2$
C. Q

37. The velocity acquired by a charged particle of mass m and charge Q accelerated from rest by a potential of V is

A. QVm
B. mQv
C. $2QVm$
D. mQV

Answer

38. A $5\ \mu\text{F}$ capacitor is fully charged by a $12\ \text{V}$ battery and then disconnected. If it is connected now parallel to an uncharged capacitor, the voltage across it is $3\ \text{V}$. Then, the capacity of the uncharged capacitor is

A. $5\ \mu\text{F}$
B. $25\ \mu\text{F}$
C. $50\ \mu\text{F}$
D. $10\ \mu\text{F}$

Answer

39. An electron moving with a constant velocity v along X-axis enters a uniform electric field applied along Y-axis. Then, the electron moves

A. with uniform acceleration along Y-axis
B. without any acceleration along Y-axis
C. in a trajectory represented as $y = ax^2$
D. in a trajectory represented as $y = ax$

Answer

40. The resistivity of the material of potentiometer wire is $5 \times 10^{-6}\ \Omega\ \text{m}$ and its area of cross-section is $5 \times 10^{-6}\ \text{m}^2$. If $0.2\ \text{A}$ current is flowing through the wire, then the potential through the wire, then the potential drop per metre length of the wire is

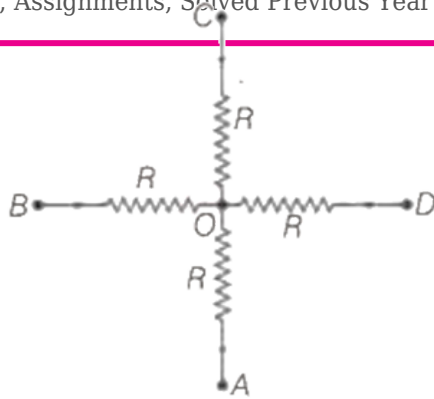
A. $0.1\ \text{Vm}^{-1}$
B. $0.5\ \text{Vm}^{-1}$
C. $0.25\ \text{Vm}^{-1}$
D. $0.2\ \text{Vm}^{-1}$

Answer

41. A battery of $6\ \text{V}$ and internal resistance $2\ \Omega$ is connected to a silver voltmeter. If the current of $1.5\ \text{A}$ flows through the circuit, the resistance of the voltmeter is

A. $4\ \Omega$
B. $2\ \Omega$
C. $6\ \Omega$
D. $1\ \Omega$

42. In the given circuit below, the points A, B and C are at same potential. If the potential difference between B and D is 30 V, then the potential difference between A and O is
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- A. 7.5 V
- B. 10 V
- C. 15 V
- D. 5 V

Answer

43. The ratio of resistances of two copper wires of the same length and of same cross-sectional area when connected in series to that when connected in parallel is
- A. 1 : 1
 - B. 1 : 2
 - C. 2 : 1
 - D. 4 : 1

Answer

44. A flow of 10^6 electrons per second in a conducting wire constitutes a flow of current
- A. 1.6×10^{-15} A
 - B. 1.6×10^{-11} A
 - C. 1.6×10^{-13} A
 - D. 1.6×10^{-19} A

Answer

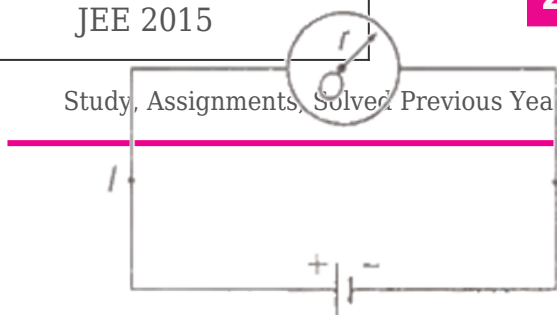
45. Identify the wrong statement.
- A. Current loop is equivalent to a magnetic dipole
 - B. Magnetic dipole moment of a planar loop of area A carrying current I is $I^2 A$
 - C. Particles like proton, electron carry an intrinsic magnetic moment
 - D. The current loop (magnetic moment m) placed in a uniform magnetic field, B experiences a torque $\zeta = m \times B$

Answer

46. A single turn circular coil is connected to a cell as shown in figure. Magnetic field at the centre O

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- A. $2\pi lr$
- B. $2\pi lr$
- C. zero
- D. $l2\pi r$

Answer

47. A proton is travelling along the x-direction with velocity $5 \times 10^6 \text{ ms}^{-1}$. The magnitude of force experienced by the proton in a magnetic field $B = 0.2 \hat{i} + 0.4 \hat{k}$ tesla is

- A. $3.2 \times 10^{-13} \text{ N}$
- B. $5.3 \times 10^{-13} \text{ N}$
- C. $3.2 \times 10^{13} \text{ N}$
- D. $6.3 \times 10^{-13} \text{ N}$

Answer

48. The shunt required to send 10% of the main current through a moving coil galvanometer of resistance 99Ω is

- A. 99Ω
- B. 9.9Ω
- C. 11Ω
- D. 10Ω

Answer

49. Two identical coils of 5 turns each carry 1 A and 2 A current respectively. Assume that they have common centre with their planes parallel to each other. If their radius is 1 m each and the direction of flow of current in the coils are in opposite directions, then the magnetic field produced on its axial line at a distance of 3 m, from the common centre is (in tesla)

- A. 0
- B. $1516 \mu_0$
- C. $816 \mu_0$
- D. $516 \mu_0$

Answer

50. The ratio of the magnetic fields produced at the centre of a solenoid for a flow of current 1 A to that produced inside toroid for the flow of current 2 A both having same number of turns per unit length. Like. Share. Bookmark. Download. Make Notes. Print - Your Favourite Questions. Join www.zigya.com

A. 1 : 1

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B. 1 : 2

C. 2 : 1

D. 1 : 4

Answer

51. A transformer connected to 220 V mains is used to light a lamp of rating 100 W and 110 V. If the primary current is 0.5 A, the efficiency of the transformer is (approximately)

A. 60 %

B. 35 %

C. 50 %

D. 90 %

Answer

52. Two long parallel wires carrying equal currents which are 8 cm apart produce a magnetic field of 200 μT mid way between them. The magnitude of the current in each wire is

A. 10 A

B. 20 A

C. 300 A

D. 40 A

Answer

53. A lamp consumes only 25 % of the peak power in an AC circuit. The phase difference between the applied voltage and the current is

A. $\pi/6$

B. $\pi/3$

C. $\pi/4$

D. $\pi/2$

Answer

54. The amplitudes E_0 and B_0 of electric and the magnetic component of an electromagnetic wave respectively are related to the velocity c in vacuum as

A. $E_0 B_0 = 1/c$

B. $E_0 = c B_0$

C. $B_0 = c E_0$

D. $E_0 = c B_0$

Answer

55. Identify the mismatched pair.

A. Microwaves — Aircraft navigation

B. Radio waves — Cellular phone

C. γ rays — Klystron

D. Ultraviolet rays — LASIK

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56. A ray of light is incident normally on one refracting surface of an equilateral prism. If the refractive index of the material of the prism is 1.5, then

- A. the emergent ray is deviated by 30°
- B. the emergent ray is deviated by 60°
- C. the emergent ray just grazes the second reflecting surface
- D. the ray undergoes total internal reflection at second refracting surface

Answer

57. The maximum velocities of the photoelectrons ejected are v and $2v$ for the incident light of wavelength 400 nm and 250 nm on a metal surface respectively. The work function of the metal in terms of Planck's constant h and velocity of light c is

- A. $hc \times 10^6 \text{ J}$
- B. $2 hc \times 10^6 \text{ J}$
- C. $1.5 hc \times 10^6 \text{ J}$
- D. $2.5 hc \times 10^6 \text{ J}$

Answer

58. A radioactive sample contains 10^{-3} kg each of two nuclear species A and B with half-life 4 days and 8 days, respectively. The ratio of the amounts of A and B after period of 16 days is

- A. 1 : 2
- B. 4 : 1
- C. 1 : 4
- D. 2 : 1

Answer

59. The binding energy per nucleon for deuteron (${}_1\text{H}^2$) and helium (${}_2\text{He}^4$) are 1.1 MeV and 7.0 MeV, respectively. The energy released when two deuterons fuse to form a helium nucleus is

- A. 36.2 MeV
- B. 23.6 MeV
- C. 47.2 MeV
- D. 11.8 MeV

Answer

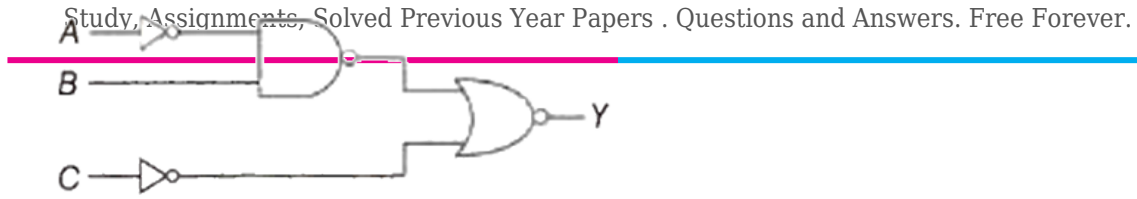
60. In a series of radioactive decays, if a nucleus of mass number 180 and atomic number 72 decays into another nucleus of mass number 172 and atomic number 69, then the number of α and β particles released respectively are

- A. 2,3
- B. 2,2
- C. 2,1
- D. 2,0

Answer

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61. For which one of the following input combinations, the given logic circuit gives the output $Y = 1$?



- A. $A = 0, B = 0, C = 0$
- B. $A = 0, B = 1, C = 0$
- C. $A = 0, B = 1, C = 1$
- D. $A = 1, B = 1, C = 1$

Answer

62. In a semiconductor, $2/3$ rd of the total current is carried by electrons and remaining $1/3$ rd by the holes. If at this temperature, the drift velocity of electrons is 3 times that of holes, the ratio of number density of electrons to that of holes is

- A. 32
- B. 23
- C. 53
- D. 33

Answer

63. In an p-n-p transistor, 10^{10} holes enter the emitter in 10^{-6} s. If 29% of holes is lost in the base, then the current amplification factor is

- A. 49
- B. 19
- C. 29
- D. 39

Answer

64. The electrical conductivity of a semiconductor increases when electromagnetic radiation of wavelength shorter than 600 nm is incident on it. The energy band gap (in eV) for the semiconductor is

- A. 1.50
- B. 0.75
- C. 2.06
- D. 1.35

Answer

65. Identify the mismatched pair

- A. Noise — Unwanted signals

- B. Repeater — Communication satellite

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Answer

66. Pick out the wrong statement.

- A. Analog signals provide a continuous set of values
- B. Digital signals represent values as discrete steps
- C. Analog signals utilise the binary system
- D. Digital signals can be processed by logic gates

Answer

67. A ground receiver receives a signal at 5 MHz, transmitted by a ground transmitter at a height of 320 m, which is 110 km away from it. Then it can communicate through (radius of the Earth, $R = 6400$ km)

- A. space waves
- B. ground waves
- C. sky waves
- D. both sky and ground waves

Answer

68. The power radiated by a linear antenna of length l at wavelength λ is

- A. directly proportional to l
- B. inversely proportional to λ
- C. inversely proportional to λ^2
- D. directly proportional to λ^2

Answer

69. An aperture of size a is illuminated by a parallel beam of light of wavelength λ . The distance at which ray optics has a good approximation is

- A. $a^2\lambda$
- B. λa^2
- C. λa
- D. $\lambda^2 a$

Answer

70. Two plane wavefronts of light, one incident on a thin convex lens and another on the refracting face of a thin prism. After refraction at them, the emerging wavefronts respectively become

- A. plane wavefront and plane wavefront
- B. plane wavefront and spherical wavefront
- C. spherical wavefront and plane wavefront
- D. spherical wavefront and spherical wavefront

Answer

71. If a ray of light is incident at a glass surface at the Brewster's angle of 60° , then the angle of deviation inside glass is

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B. 60°

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D. 30°

Answer

72. Identify the wrong sign convention.

- A. The magnification for virtual image formed by a convex lens is positive.
- B. The magnification for real image formed by a convex lens is negative
- C. The magnification for virtual image formed by a concave lens is negative
- D. The distances measured in the direction of incident light is positive

Answer