GGSIPU physics 2013

1. In a common base configuration I_e = 1 mA ;α = 0.95, the value of base current is

a 1.95 mA b 0.05 mA

c 1.05 mA d 0.95 mA

2. A Si specimen is made into p-type semiconductor is made into by doping on an average one indium atom per 6 x 10^7 silicon atoms. If the number density of atoms in Si be 6 x $10^{28/}m^3$, what is the indium atoms per cm^3?

a 10^{12} b 10^{15}

c 10^{18} d 10^{20}

3. The minimum wavelemgth of X-ray emitted by X-ray tube is 0.4125 $\mathring{A}$. The accelerating voltage is

a 30 kV b 50 kV

c 80 kV d 60 kV

4. The ionization potential of hydrogen atom is 13.6 V. How much energy need to be supplied to ionize the hydrogen atom in the first excited state?

a 13.6 eV b 27.2 eV

c 3.4 eV d 6.8 eV

5. What is the percentage error in the measurement of time period of a pendulum if maximum errors in measurement of l and g are 2% and 4% respectively

a 6% b 4%

c 3% d 5%

6. A body travelling along a straight line one-third of the total distance with a velocity 4 m/s. The remaining part of the distance was covered with a velocity 2 m/s for half the time and with a velocity 6 m/s for the whole time of motion is

a 5 m/s b 4 m/s

c 4.5 m/s d 3.5 m/s

7. A body of mass 2 kg moves with an acceleration 3 ms^{-2}. The change in momentum in one second is

a $\frac{2}{3}$ kg ms^{-1} b $\frac{3}{2}$ kg ms^{-1}

c 6 kg ms $^{-1}$ d None of these

8. When an axle rotates in a sleeve,the friction involved in the process is

a sliding b rolling

c lim iting d None of these

9. Two bodies A and B having mass m and respectively passes same kinetic energy. Given that M>m. If p_A and p_B be their moments, then which of the following statements is true?

a $\rho_A = \rho_B$ b $\rho_A > \rho_B$

c $\rho_A < \rho_B$ d It cannot be predicted

10. A gun of mass M fires a bullet of mass m with maximum speed ν. Given that m<M. The kinetic energy of the gun will be

a $\frac{1}{2}mv^2$ b $\frac{1}{2}Mv^2$

c more than $\frac{1}{2}mv^2$ d less than $\frac{1}{2}Mv^2$

11. If a solid sphere and solid cylinder of same mass and density rotate about their own axis the moment of inertia will be greater for

a solid sphere b solid cylinder

c both a and b d equal both

12. if V is the gravitational potential on the surface of the earth,then what is its value at the centre of the earth?

a 2V b 3V c $\frac{3}{2}V$ d $\frac{2}{3}V$

13. If γ be the ratio of specific heats of a perfect gas, the number of degrees of freedom of a molecule of the gas is

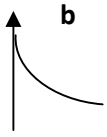
a $\frac{25}{2}(\gamma-1$ b $\frac{3\gamma-1}{2\gamma-1}$

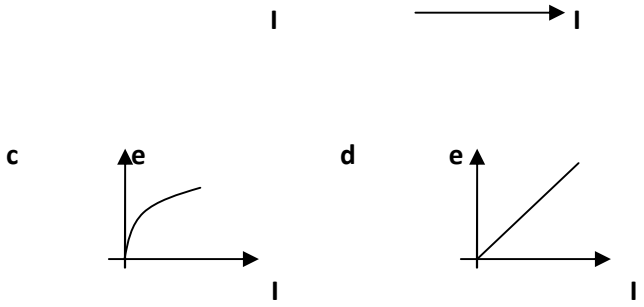
c $\frac{2}{\gamma-1}$ d $\frac{9}{2}(\gamma-1$

14. If L-R circuit connected to a battery of constant emf E switch S is closed at time t =0. If e denotes the induced emf across inductor and I the current in the circuit at any time t. Then which of the following graphs shows the variation of e with i?

a e

b e





15. Two identical glass $\mu_g = 3/2$ equiconvex lenses of focal length f are kept in contact. The space between the two lenses is filled with water $\mu_w = 4/3$. The focal length of the combination is

a f b f/2 c $\frac{4f}{3}$ d $\frac{3f}{4}$

16. A slab consists of two parallel layers of two different materials of same thickness and thermal conductivies $\Re_1$ and $\Re_2$. The equivalent thermal conductivity of the slab is

a $k_1 - k_2$

b k_1 / k_2

c $\frac{2k1\ k2}{k1+k2}$

d $\frac{k1+k2}{2k1\ k2}$

17. The relation between Young's modulusY, bulk modulus K and modulus of elasticity η is

a $\frac{1}{y} = \frac{1}{k} = \frac{3}{\eta}$

b $\frac{3}{y} = \frac{1}{\eta} + \frac{1}{3k}$

c $\frac{1}{y} = \frac{3}{\eta} + \frac{1}{3k}$

d $\frac{1}{\eta} = \frac{3}{y} + \frac{1}{3k}$

18. A point particle of mass 0.1 kg is executing SHM of amplitude 0.1 m. When the particle passes through the mean position, its KE is $8x10^{-3}$ J. The equation of motion of this particle phase of oscillation is 45^0 is

a $y = 0.1\sin\left(\frac{t}{4} + \frac{\pi}{4}\right)$

b $y = 0.1\sin\left(\frac{t}{2}+\frac{\pi}{4}\right)$

c $y = 0.1\sin\left(4t-\frac{\pi}{4}\right)$

d $y = 0.1\sin\left(4t+\frac{\pi}{4}\right)$

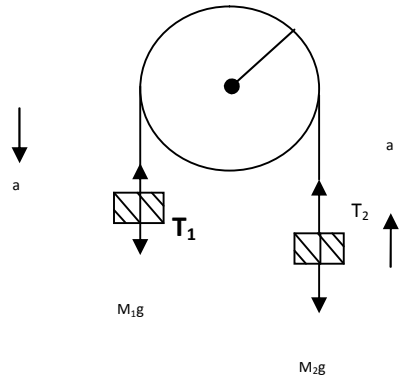
19. A man weights 60 kg at earth surface. At what height above the earth's surface weight become 30 kg?

Given redius of earth is 6400 km.

a 2624 km **b** 3000 km

c 2020 km **d** None of these

20. Two bodies m_1 and m_2 are attached to the two ends of a string figure. The string passes over a pulley of mass M and radius R. If $m_1 > m_2$, then the acceleration of the system is



a $\frac{(m_1-m_2+m)g}{m_1+m_2+m}$ b $\frac{(m_1-m_2)g}{m_1+m_2}$

c $\frac{(m_1+m_2)g}{m_1-m_2}$ d $\frac{(m_1-m_2)g}{m_1+m_2+m/2}$

21. A ball falls vertically onto a floor with momentum p and then bounces repeatedly, the coefficient of restitution is e. The total momentum imparted by the ball to the floor is

a $\rho\{1+e)$ b $\frac{1}{1-e}$

c $\rho\left(\frac{1+e}{1-e}\right)$ d $\rho\left(1-\frac{1}{e}\right)$

22. A machine which is 75 per cent efficient uses 12 J of energy is lifting up a 1 kg mass through a certain distance. The mass is then allowed to fall through that distance. What will its velocity be at the end of its fall?

a $\sqrt{24}$ m/s b $\sqrt{32}$ m / s

c $\sqrt{8}$ m/s d $\sqrt{9}$

23. An unloaded car moving with velocity u on a frictionless road can be stopped in a distances s. If passengers add 40% to its weight and breaking force remains the same, the stopping distance at velocities is now

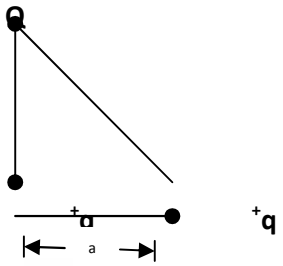
a 1.4 s b $\sqrt{1.4}$ s c 1.4 ^{2} s d $\frac{1}{1.4}$ s

24. A hollow charged metal sphere has a redius r. If the potential difference between its surface and a point at distance 3r from the centre is

a V/6r b V/4 r

c V/3 r d v/2 r

25. Three charges Q,q and – q are placed at the vertices of right angled isosceles triangle as shown in the figure. The net electrostatic energy of the configuration is zero if Q is equal to



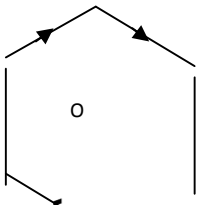
a $\frac{-q}{1+\sqrt{2}}$

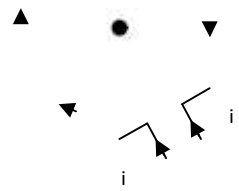
b $\frac{-2q}{2+\sqrt{2}}$

c $-2q$

d $+2$

26. A current I is is flowing in a hexagonal coil of side l figure. The magnetic induction at the centre of the coil will be





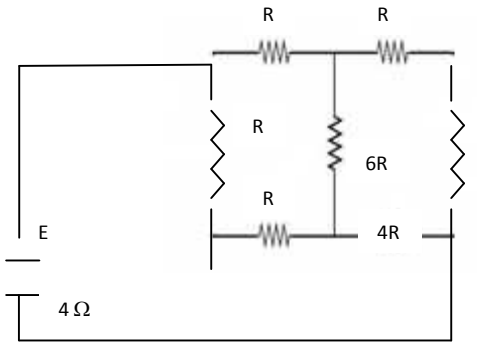
a $\frac{\sqrt{3}\mu_{0i}}{\pi l}$

b $\frac{\mu_{0i}}{\sqrt{3}\pi l}$

c $\frac{\mu_{0i}}{3\sqrt{3}\pi l}$

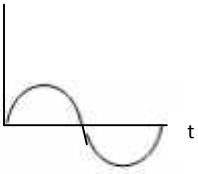
d $\frac{3\sqrt{3}\mu_{0i}}{\pi l}$

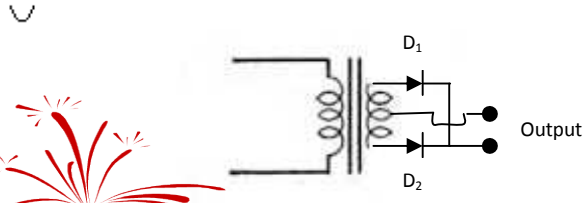
27. A battery of internal resistance 4 Ω is connected to the network of resistances as shown. In order that the maximum power can be delivered to the network, the value R in Ω should be

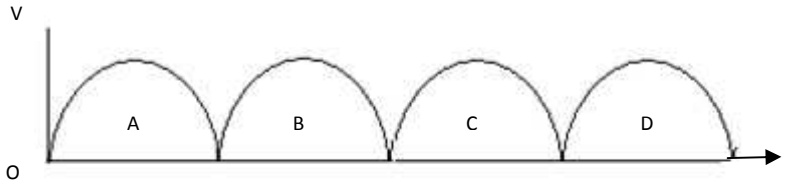


a) $\frac{4}{9}$ b 2 c $\frac{8}{3}$ d 18

28. A full wave rectifier circuit along with the output is shown in the figure. The contributions from the diode is are







a C b A,C

c B,C,D d A,B,C,D

29. A radioactive substance X decays into another radioactive substance Y. Initially only X was present, λx and λy are the disintegration constants of X and Y. N_x and N_y are the number of nuclei of X and Y at any time t. Number of nuclei N_y will be maximum when

a $\frac{N_y}{N_x - N_y} = \frac{\lambda_y}{\lambda_x - \lambda_y}$

b $\frac{N_x}{N_x - N_y} = \frac{\lambda_x}{\lambda_x - \lambda_y}$

c $\lambda_y N_y = \lambda_k N_x$

d $\lambda_y N_y = \lambda_k N_x$

30. An electron in hydrogen atom after absorbing an energy photonjumps from energy state n_1 to n_2. Then it returns to ground state after emitting six different wavelengths in emission spectrum. The energy of emitted photons is either equal to less than the absorbed photons. The n_1 and n_2 are

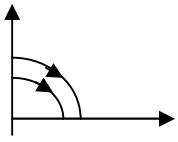
a $n_2 = 4, n_1 = 3$

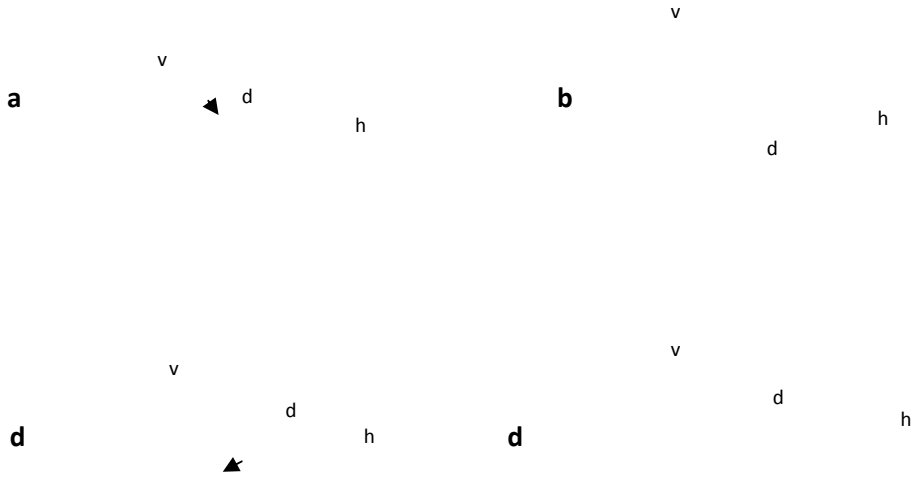
b $n_2 = 5, n_1 = 3$

c $n_2 = 4, n_1 = 1$

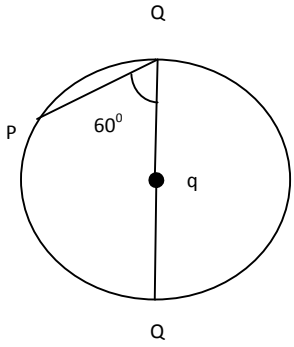
d $n_2 = 4, n_1 = 1$

31. A ball is drpped vertically from a height d above the ground and bounce up vertically to a height d/2. Neglecting subsequent motion and air resistance its velocity v varies with height h above the ground as





32. Two particles 1 and 2 are allowed to descend on two frictionless chords OP and OQ. The ratioof the speeds of the particles 1 and 2 respectivelv when they reach on the circumference is



a $\frac{1}{4}$ **b** $\frac{1}{2}$

c 1 **d** $\frac{1}{2\sqrt{2}}$

33. A body of mass m, having momentum p is moving on a rough horizontal surface. If it is stopped in a distance x, the coefficient of friction between the body and the surface is

a $\mu = \frac{p}{2mgx}$ **b** $\mu = \frac{p^2}{2mgx}$

c $\mu = \frac{p^2}{2gm^2x}$ **d** $\mu = \frac{p^2}{2gm^2x^2}$

34. When a ceiling fan is switched off, its angular velocity reduces to half its initial value after it completes 36 rotations. The number of rotations it will make further before coming to rest is Assuming angular retardation to be uniform

a 10 b 20

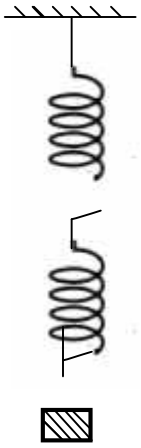
c 18 d 12

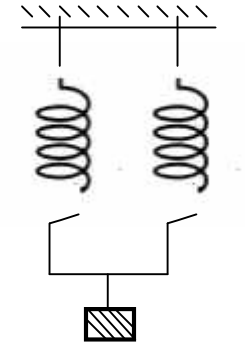
35. A uniform metal rod is used as a bar pendulum. If the room temperature rises by 10^0 C and the coefficient of linear expansion of the metal of the rod is 2×10^{-6} per ^{0}C , the period of the pendulum will have percentage increases of

a -2×10^{-3} b -1×10^{-3}

c 2×10^{-3} d 1×10^{-3}

36. Two identical springs of constant are connected in series and parallel as shown in figure. A mass m is suspended from them. The ratioo0f their frequencies of vertical oscillations will be





a 2:1 b 1:1

c 1:2 d 4:1

37. An astronaut is approaching the moon. He sends a radio wave of frequency 5×10^9 Hz towards the moon. The frequency of the radio echo received by him has a frequency 9×10^4 Hz more than that of the real frequency. The relative to the moon is

a 5.40 km/s b 4.05 km/s

c 2.70 km/s d 1.35 km/s

38. Ultraviolet light of wavelength 300 nm and intensity 1.0 W/m^2 falls on the surface of a photosensitive material. If one per cent of the incident photons produce photo electrons, then the

number of photo electrons, then the number of photo electrons emitted from an area of 1.0 cm^2 of the surface is nearly

a $19.61 \times 10^{14} s^{-1}$ b $4.12 \times 10^{-13} s^{-1}$

c $1.51 \times 10^{12} s^{-1}$ d $2.13 \times 10^{11} s^{-1}$

39. An X-ray tube operated at 50 kV, produces heat at the target at the rate of 796 W. If 0.5% energy of incident electrons striking the target per second will be

a 10^{19} b 10^{18}

c 10^{17} d 10^{16}

40. The masses of two isotopes of chlorine are 34.980 and 36.978. If the radius of the circular path in Bainbridge mass spectrograph corresponding to lighter is 5 cm, the distance between the spots on photographic plate marked by two isotopes will be

a 5.7 cm b 0.57 cm

c 0.57 mm d 0.57 m

41. In the uranium radioactive series, the initial nucleus is $_{92}U^{238}$ and that the final nucleus is $82Pb^{206}$. When uranium nucleus decays to lead the number of α-particles and β-particles emitted are

a 8 α, 6 β b 6 α, 7 β

c 6 α, 8 β d 4 α, 3 β

42. A gas of monoatomic hydrogen is bombarded with a stream of electrons that have been accelerated from rest through a potential difference of 12.75 V. In the emission spectrum one cannot observe any line of

a Lyman series b Balmer series

c paschen series d Pfund series

43. The maximum intensity in Young's double slit experiment is I_0. Distance between the slits is d = 5λ,where λ is the wavelength of monochromatic light used in the experiment. What will be the intensity of light infront of one of the slits on a screen at a distance D = 10d?

a I_0 b $I_0/4$

c $\frac{3}{4} I_0$ d $I_0/2$

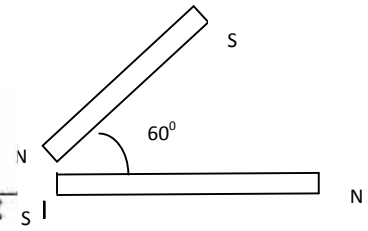
44. A lamp is hanging at a height of 40 m from the centre of a table. If its height is increased by 10 cm, the illuminance on the table will decrease by

a 10% b 20% c 27% d 36%

45. According to Maxwell's equation, the velocity of light in any medium is expressed as

a $\frac{1}{\sqrt{\mu_0 \varepsilon_0}}$ b $\frac{1}{\sqrt{\mu\varepsilon}}$ c $\frac{1}{\sqrt{\mu/\varepsilon}}$ d $\sqrt{\frac{\mu_0}{\varepsilon}}$

46. Two magnets of equal magnetic moments M each are placed as shown in figure. The resultant magnetic moment is



a M b $\sqrt{\ }$ S I

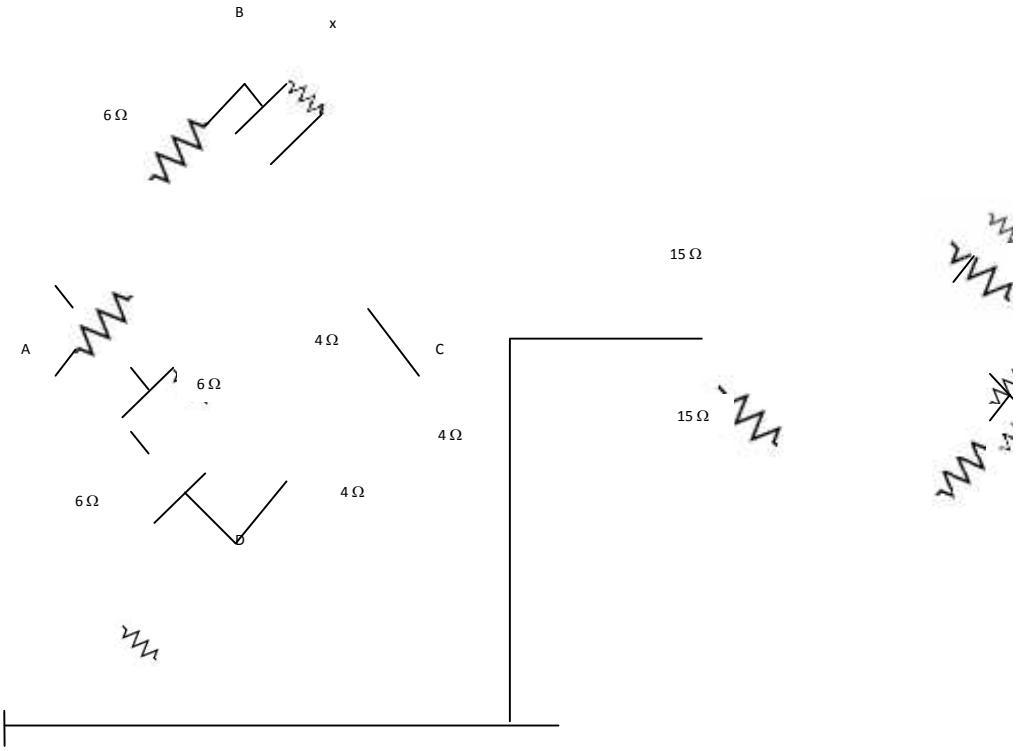
c $\sqrt{2}$M d M/2

47. The hysteresis cycle for the material of permanent magnet is

a short and wide b tall and narrow

c tall and wide d short and narrow

48. In the circuit shown in figure, the value of resistance x, when the potential difference between the points B and D is zero, will be



a 9 Ω b 8 Ω c 6 Ω d 4 Ω

49. A mercury drop of radius 1 cm is broken into 10^6 droplets of equal size. The work done is $\rho = 35 \times 10^{-2}$ N/m

a 4.35×10^{-2} b 4.35×10^{-3} J

c 4.35×10^{-6} J d 4.35×10^{-8} J

50. A spaceman in training is rotated in a seat at the end of a horizontal rotating arm of length 5m. If he can withstand accelerations upto 9g, then what is the maximum number of revolutions per second permissible?

Take $g = 10\ m/s^2$

a 13.5 rps
b 1.35 rps
c 0.675 rps
d 6.75 rps