INDIAN ASSOCIATION OF PHYSICS TEACHERS
NATIONAL STANDARD EXAMINATION IN PHYSICS 2018-19
Date of Examination: 25th November, 2018
Time: 0830 to 1030 hrs

Q. Paper Code: P160

Write the question paper code mentioned above on YOUR answer sheet (in the space provided), otherwise your answer sheet will NOT be assessed.
Note that the same Q.P. Code appears on each page of the question paper.

Instructions to Candidates –

1. Use of mobile phones, smartphones, ipads during examination is **STRICTLY PROHIBITED**.
2. In addition to this question paper, you are given answer sheet along with Candidate's copy.
3. On the answer sheet, make all the entries carefully in the space provided **ONLY** in **BLOCK CAPITALS** as well as by properly darkening the appropriate bubbles.
   Incomplete/incorrect/carelessly filled information may disqualify your candidature.
4. On the answer sheet, use only **BLUE or BLACK BALL POINT PEN** for making entries and filling the bubbles.
5. The email ID and date birth entered in the answer sheet will be your login credentials for accessing performance report. Please take care while entering.
6. Question paper has two parts. In part A1(Q. Nos. 1 to 60) each question has four alternatives, out of which **only one** is correct. Choose the correct alternative and fill the appropriate bubble, as shown.

   In part A2 (Q. Nos. 61 to 70) each question has four alternatives out of which **any number of alternatives** (1, 2, 3 or 4) may be correct. You have to choose ALL correct alternatives and fill the appropriate bubbles, as shown.

7. For **Part A1**, each correct answer carries 3 marks whereas 1 mark will be deducted for each wrong answer. In **Part A2**, you get 6 marks if all the correct alternatives are marked. No negative marks in this part.
8. Any rough work should be done only in the space provided.
9. Use of **non – programmable** calculator is allowed.
10. No candidate should leave the examination hall before the completion of the examination.
11. After submitting your answerpaper, take away the Candidate's copy for your reference.

Please DO NOT make any mark other than filling the appropriate bubbles properly in the space provided on the answer sheet.
Answer sheets are evaluated using machine, hence CHANGE OF ENTRY IS NOT ALLOWED.
Scratching or overwriting may result in a wrong score.

P160

INDIAN ASSOCIATION OF PHYSICS TEACHERS

NATIONAL STANDARD EXAMINATION IN PHYSICS 2018-19

Total Time: 120 minutes (A-1 and A-2)

A-1

ONLY ONE OUT OF FOUR OPTIONS IS CORRECT

1. The SI unit of permeability of free space is

(A) $\frac{\text{weber}}{\text{ampere}}$ (B) $\frac{\text{henry}}{\text{ampere}}$ (C) $\frac{\text{tesla}}{\text{ampere}-\text{meter}}$ (D) $\frac{\text{weber}}{\text{ampere}-\text{meter}}$

2. A uniform solid drum of radius R and mass M rolls without slipping down a plane inclined at an angle θ. Its acceleration along the p lane is

(A) $\frac{1}{3}g\sin\theta$ (B) $\frac{1}{2}g\sin\theta$ (C) $\frac{2}{3}g\sin\theta$ (D) $\frac{5}{7}g\sin\theta$

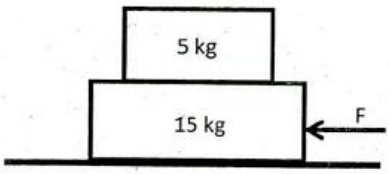
3. A particle moves according to the law x = at, y = at(1 – αt) where a and α are positive constants and t is time. The time instant at which velocity makes an angle $\frac{\pi}{4}$ with acceleration is

(A) $\frac{4}{\alpha}$ (B) $\frac{3}{\alpha}$ (C) $\frac{2}{\alpha}$ (D) $\frac{1}{\alpha}$

4. The potential energy of a particle of mass m in a conservative force field can be expressed as U = αx – βy where (x, y) denote the position coordinates of the body. The acceleration of the body is

(A) $\frac{\alpha-\beta}{m}$ (B) $\frac{\alpha+\beta}{m}$ (C) $\frac{\sqrt{\alpha^2-\beta^2}}{m}$ (D) $\frac{\sqrt{\alpha^2+\beta^2}}{m}$

5. A constant force F applied to the lower block of mass 15 kg makes it slide between the upper block of mass 5 kg and the table below, as shown. the coefficients of static (μ_s) and kinetic (μ_k) friction between the lower block and the table are 0.5 and 0.4 respectively and those between the two blocks are 0.3 and 0.1. The accelerations of the upper and the lower blocks are respectively.



(A) 1.96 m/s^2 and 1.96 m/s^2 (B) 1.96 m/s^2 and 3.92 m/s^2
(C) 0.98 m/s^2 and 0.49 m/s^2 (D) 0.98 m/s^2 and 1.96 m/s^2

6. Two bodies of equal masses moving with equal speeds make a perfectly inelastic collision. If the speed after the collision is reduced to half, the angle between their velocities of approach is

(A) 30° (B) 60°
(C) 90° (D) 120°

7. A student performs an experiment with a simple pendulum and records the time for 20 oscillations. If he would have recorded time for 100 oscillations, the error in the measurement of time period would have reduced by a factor of
(A) 80 (B) 20
(C) 10 (D) 5

8. A satellite is lunched from a point close to surface of the earth (radius R) with a velocity $v = v_0\sqrt{1.5}$, where v_0 is the velocity in a circular orbit. If the initial velocity imparted to the satellite is horizontal, the maximum distance from the surface of the earth during its revolution is
(A) R (B) 2R
(C) 3R (D) 4R

9. The aperture diameter of a plane-convex lens is 6 cm and its thickness is 3 mm. If the speed of light through its material is $v = 2 \times 10^8$ m/s, the focal length of the lens is
(A) 40 cm (B) 35 cm
(C) 30 cm (D) 20 cm

10. Under standard conditions of temperature and pressure a piece of ice melts completely on heating it. Obviously the increase in internal energy of the system (ice and water) is
(A) equal to the heat given. (B) more than the heat given
(C) less than the heat given (D) zero

11. Rocket fuel is capable of giving an exhaust velocity of v_{rel} = 2.4 km/s in the absence of any external forces. The fuel required per kg of the payload to provide an exhaust velocity of 12 km/s to the rocket is
(A) 3670 kg (B) 8000 kg
(C) 147.4 kg (D) 478.4 kg

12. A vertical spring of length ℓ_0 and force constant K is stretched by ℓ when a mass m is suspended from its lower end. By pulling the mass down a little the system is left off to oscillate. The time period of oscillation is
(A) $2\pi\sqrt{\frac{\ell}{g}}$ (B) $2\pi\sqrt{\frac{\ell_0}{g}}$
(C) $\frac{1}{2\pi}\sqrt{\frac{m}{k}}$ (D) $2\pi\sqrt{\frac{\ell+\ell_0}{g}}$

13. Let R be the radius of the earth. In general, the loss of gravitational potential energy of a body of mass m falling from a height h to the earth surface is
(A) mgh (B) $mgh\frac{R}{R+h}$
(C) $mgh\sqrt{\frac{R+h}{R}}$ (D) $mgh\sqrt{\frac{R}{R+h}}$

14. The velocity of a projectile at the highest point of its trajectory is $\sqrt{0.4}$ of its velocity at a point at half its maximum height. The angle of projection is
(A) 30° (B) 45°
(C) 60° (D) $\tan^{-1}(\sqrt{0.4})$

15. The combination of a steel wire (length 80 cm, area of cross section 1 mm^2) and an aluminium wire (length 60 cm, area of cross section 3 mm^2) joined end to end is stretched by a tension of 160 N. If the densities of steel and aluminium are 7.8 g/cc and 2.6 g/cc respectively then, the minimum frequency of tuning fork which can produce standing waves in the composite wire, with the joint as a node, is
(A) 179 Hz (B) 358 Hz
(C) 88 Hz (D) 118 Hz

16. In a stationary wave
(A) all the medium particles vibrate in the same phase.
(B) all the particles between two consecutive nodes vibrate in the same phase.
(C) any two consecutive nodes vibrate in the same phase.
(D) all the particles between two consecutive antinodes vibrate in the same phase.

17. An empty earthen pitcher is kept under a water tap and starts filling with water as the tap is opened. The pitched of the sound produced
(A) goes on decreasing.
(B) goes on increasing.
(C) first increases and then decreases after the pitcher is half filled.
(D) does not change.

18. The molar specific heat of an ideal gas in a certain thermodynamic process is $\frac{\alpha}{T}$ where α is a constant. If the adiabatic exponent is $\gamma = \frac{C_P}{C_V}$, the work done in heating the gas form t_0 t nT_0 is
(A) $\frac{1}{\alpha}\ln n$ (B) $\alpha \ln n - \frac{(n-1)}{(\gamma-1)}RT_0$
(C) $\alpha \ln n - (\gamma - 1)RT_0$ (D) $\frac{(n-1)}{(\gamma-1)}RT_0$

19. An aircraft flied at a speed v from city A to city B and back in time t_0. City B is to the east of city A at a distance d. The aircraft takes time t_1 for the round trip if wind blows with speed w along AB and time t_2 if the wind blows with the same speed perpendicular to AB. Then,
(A) $t_1 = t_2 = t_0$ (B) $t_1 > t_2 > t_0$
(C) $t_1 < t_2 < t_3$ (D) $t_1 > t_0 > t_2$

20. The Hubble telescope in orbit above the earth has a 2.4 m circular aperture. The telescope has equipment for detecting ultraviolet light. The minimum angular separation between two objects that the telescope can resolve in ultraviolet light of wavelength 95 nm is
(A) 4.83×10^{-8} rad (B) 4.03×10^{-8} rad
(C) 2.41×10^{-8} rad (D) 2.00×10^{-8} rad

21. A projectile is fired from ground with velocity u at an angle θ with the horizontal. It would be moving perpendicular to its initial direction of projection after a time t equal to
(A) $\frac{u\sin\theta}{g}$ (B) $\frac{2u\sin\theta}{g}$
(C) $\frac{u}{g\sin\theta}$ (D) $\frac{u}{2g\sin\theta}$

22. The critical angle for light passing from glass to air is minimum for the light of wavelength
(A) $0.7\mu m$ (B) $0.6\mu m$
(C) $0.5\mu m$ (D) $0.4\mu m$

23. A thin hollow equiconvex lens, silvered at the back, converges a beam of light parallel to the principal axis at a distance 0.2 m. When filled with water $\left(\mu = \frac{4}{3}\right)$, the same beam will be converged at a distance of

(A) 3.75 cm
(B) 3.25 cm
(C) 0.12 m
(D) None of the above

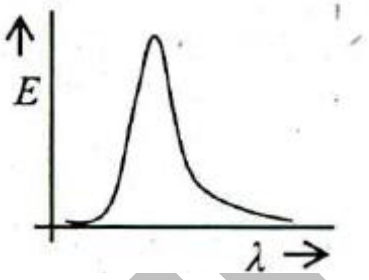
24. An air bubble is situated at a distance 2.0 cm from the centre of a spherical glass paper weight of radius 5.0 CM AND REFRACTIVE INDEX 1.5. The bubble is seen through the nearest surface. It appears at a distance ν from the centre. Therefore, ν is

(A) 3.75 cm
(B) 3.25 cm
(C) 2.50 cm
(D) 3.80 cm

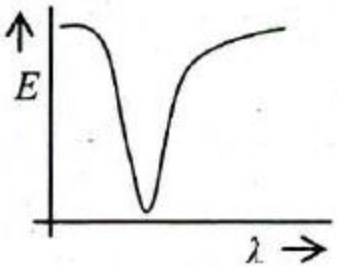
25. A student while performing experiment with a sonometer with bridges separated by a distance of 80 cm, missed out some of the observations. However, he claimed that the three resonant frequencies for a given tuning fork were 84, 140 and 224 Hz. The speed of transverse waves on the wire is

(A) 33.30 m/s
(B) 330.0 m/s
(C) 44.80 m/s
(D) 448.0 m/s

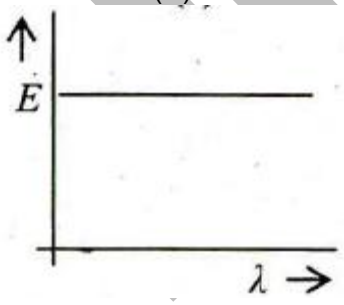
26. Which of the following curves represents spectral distribution of energy of black body radiation?



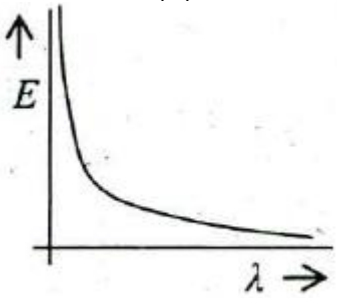
(A)



(B)



(C)



(D)

27. A Sphere and a cube having equal surface area are made of the same material. The two are heated to the same temperature and kept in identical surrounding. The ratio of their initial rates of cooling is

(A) 1 : 1
(B) $\sqrt{\frac{\pi}{2}}:1$
(C) $\sqrt{\frac{\pi}{3}}:1$
(D) $\sqrt{\frac{\pi}{6}}:1$

28. Consider the diffraction pattern due to a single slit. The first maximum for a certain monochromatic light coincides with the first minimum for red light of wavelength 660 nm. The wavelength of the monochromatic light is
(A) 660 nm. (B) 550 nm.
(C) 440 nm. (D) 330 nm.

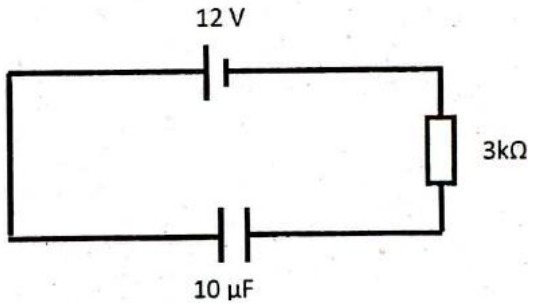
29. A concave lens of focal length f produces an image (1/n) times the size of the object. The distance of the object from the lens is
(A) $(n+1)f$ (B) $\frac{(n-1)}{n}f$
(C) $\frac{(n+1)}{n}f$ (D) $(n-1)f$

30. The Sun having radius R and surface temperature T, emits radiation as a perfect emitter. The distance of the earth from the sum is r and the radius of the earth is R_e. The total radiant power incident on the earth is
(A) $\frac{R_e^2R^2\sigma T^4}{4\pi r^2}$ (B) $\frac{R_e^2R^2\sigma T^4}{r^2}$
(C) $\frac{4\pi R_e^2R^2\sigma T^4}{r^2}$ (D) $\frac{\pi R_e^2R^2\sigma T^4}{r^2}$

31. A cylinder containing water (refractive index 4/3) is covered by an equiconvex glass (refractive index 3/2) lens of focal length 25 cm. At the mid – day when the sun is just overhead, the image of the sun will be seen at a distance of
(A) 100 cm (B) 50 cm
(C) 37.5 cm (D) 25 cm

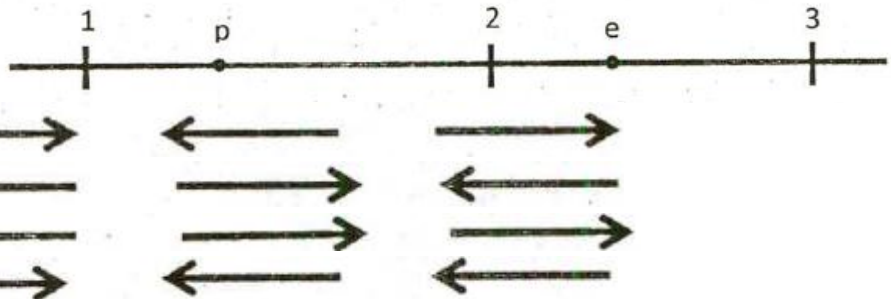
32. A rectangular loop carrying a current is placed in a uniform magnetic field. The net force acting on the loop.
(A) depends on the direction and magnitude of the current.
(B) depends on the direction and magnitude of the magnetic field.
(C) depends on the area of the loop.
(D) is zero.

33. The capacitor in the circuit shown below carries a charge of $30\,\mu C$ at a certain time instant. The rate at which energy is being dissipated in the $3k\Omega$ resistor at that instant is
(A) 4 mW
(B) 9 mW
(C) 27mW
(D) 48 mW



34. A hollow conducting sphere of radius 15 cm has a uniform surface charge density $+3.2\,\mu C/m^2$. When a point charge q is placed at the centre of the sphere, the electric field at 25 cm from the centre just reverses its direction keeping the magnitude the same. Therefore, q is
(A) $+0.91\mu C$ (B) $-0.91\mu C$
(C) $+1.81\mu C$ (D) $-1.81\mu C$

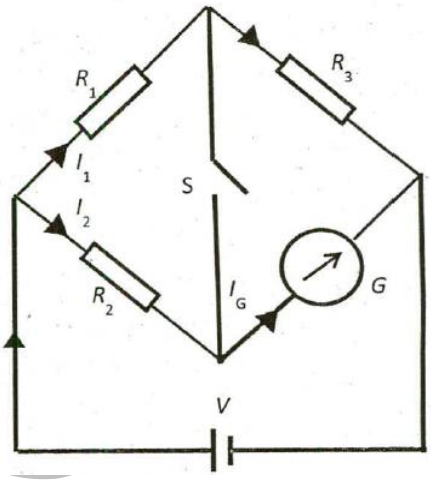
35. An electron (e) and proton (p) are situated on the straight line as shown below. The directions of the electric field at the point 1, 2 and 3 respectively, are shown as



(A)
(B)
(C)
(D)

36. In the circuit shown $R_1 \neq R_2$. The reading in the galvanometer is the same with switch S open or closed. Then.

(A) $I_1 = I_G$
(B) $I_2 = I_G$
(C) $I_3 = I_G$
(D) $I_4 = I_G$



37. A thin wire of length 1 m is placed perpendicular to the XY plane. If it is moved with velocity $\vec{v} = 4\hat{i} - \hat{j}$ m/s in the region of magnetic induction $\vec{B} = \hat{i} - 4\hat{j}$ Wb/m^2. The potential difference developed between the ends of the wire is

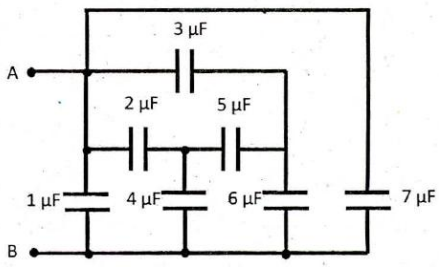
(A) zero
(B) 3V
(C) 15 V
(D) 17V

38. A steel cooking pan has copper coating at its bottom. The thickness of copper coating is half the thickness of steel bottom. The conductivity of copper is three times that of steel. If the temperature of blue flame is 119°C and that of the interior of the cooking pan is 91°C, then the temperature at the interface between the steel bottom and the copper coating in the steady state is

(A) 98°C
(B) 103°C
(C) 115°C
(D) 108°C

39. The total capacitance between points A and B in the arrangement shown below is:

(A) 28 μF
(B) $\frac{34}{7}\mu F$
(C) 23 μF
(D) $\frac{34}{3}\mu F$



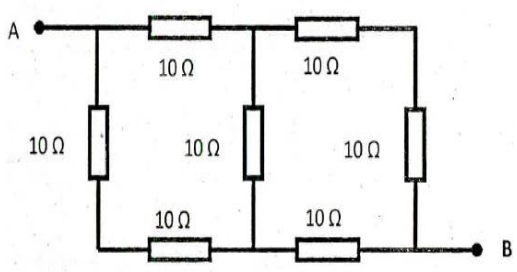
40. A fiber sheet of thickness 1 mm and a mice sheet of thickness 2 mm are introduced between two metallic parallel plates to form a capacitor. Given that the dielectric strength of fibre is 6400 kV/m and the dielectric constants of fiber and mica are 2.5 and 8 respectively, the electric field inside the mica sheet just at the breakdown of fiber will be
(A) 200 kV/m (B) 2048 kV/m
(C) 3200 kV/m (D) 6400 kV/m

41. The position vector of a point mass is expressed as $\vec{r} = at\hat{i} + bt^2\hat{j}$. The trajectory of the particle is
(A) a straight line (B) a parabola
(C) a hyperbola (D) none of the above

42. In a series LCR circuit fed with an alternating emf $E = E_0 \sin \omega t$,
(A) the voltage across L is in phase with the applied emf E
(B) the voltage across C is the phase with the applied emf E
(C) the voltage across R is in phase with the applied emf E
(D) the voltage across L, C and R are all in phase with the applied emf E

43. A conducting wire is bent in the form of a n sided regular polygon enclosed by a circle of radius R. The magnetic field produced at its center by a current I flowing through the wire is
(A) $\frac{\mu_o i}{2R}\frac{\sin\frac{\pi}{n}}{\frac{\pi}{n}}$ (B) $\frac{\mu_0 i}{2R}\frac{\cos\frac{\pi}{n}}{\frac{\pi}{n}}$
(C) $\frac{\mu_0 i}{2R}\frac{\tan\frac{\pi}{n}}{\frac{\pi}{n}}$ (D) $\frac{\mu_0 i}{2R}\frac{\cot\frac{\pi}{n}}{\frac{\pi}{n}}$

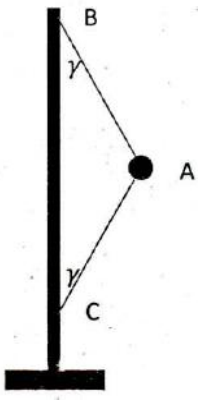
44. The effective resistance between points A and B in the circuit arrangement shown below is:
(A) 14Ω
(B) 15 Ω
(C) 30 Ω
(D) none of the above



45. The magnetic dipole moment of an electron is the S state of hydrogen atom revolving in a circular orbit of radius 0.0527 nm with a speed 2.2×10^6 is
(A) 4.64×10^{-24} Am^2 (B) 9.28×10^{-24} Am^2
(C) 18.56×10^{-24} AM^2 (D) 2.32×10^{-24} Am^2

46. A steel cable hanging vertically can support a maximum load W. The cable is cut to exactly half of its original length, the maximum load that it can support now is
(A) W (B) $\frac{W}{2}$
(C) 2W (D) more than $\frac{W}{2}$ but less than W

47. The string AB and AC each of length 40 cm, connect a ball of mass 200 g to a vertical shaft as shown. When the shaft rotates at a constant angular speed ω, the ball travels in a horizontal circle with the strings inclined at $y = 30^0$ to the shaft . If the tension in the string AC in 4 N, that in the string AB and the angular speed ω respectively, are



(A) 6.26 N and 11.32 rad/s
(B) 7.92 N and 14.32 rad/s
(C) 7.92 N and 11.32 rad/s
(D) 6.26 N and 14.32 rad/s

48. A tightly wound long solenoid carries a current 5 A. An electron shot perpendicular to the solenoid axis inside it revolves at a frequency 10^8 rev/s. The number of turns per meter length of the solenoid is

(A) 57 (B) 176
(C) 569 (D) 352

49. The same alternating voltage $v = V_0 \sin(\omega t)$ is applied in both the LCR circuits shown below. The current through the resistance R at resonance is

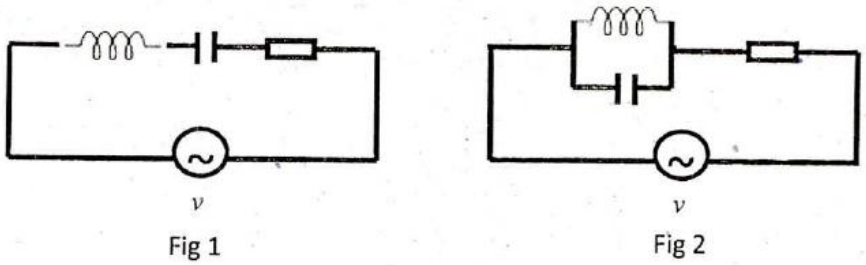
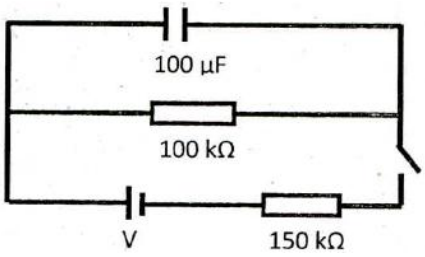


Fig 1 Fig 2

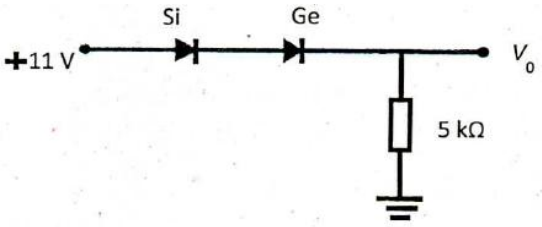
(A) maximum in Fig (1) and maximum in Fig (2)
(B) minimum in Fig (1) and maximum in Fig (2)
(C) maximum in Fig (1) and minimum in Fig (2)
(D) minimum in Fig (1) and minimum in Fig (2)

50. The switch S in the circuit shown is closed for a long time and then opened at time t = 0. The current in the 100 kΩ resistance at t = 3s is



(A) zero
(B) 48 μA
(C) 35.5 μA
(D) 16 μA

51. In the network shown below the voltage V_0 is nearly



(A) 10 volt
(B) 11 volt
(C) 12 volt
(D) zero volt

52. The energy of the characteristic X – ray photon in a Coolidge tube comes from
(A) the kinetic energy of striking electron
(B) the kinetic energy of the free electrons of the target
(C) the kinetic energy of the ions of the target
(D) the electronic transition of the target atom

53. The maximum wavelength that can ionize a hydrogen atom initially in the ground state is
(A) 660.0 nm (B) 364.5 nm
(C) 121.9 nm (D) 91.4 nm

54. The wavelength of the waves associated with a proton and a photon are the same. Therefore, the two have equal
(A) mass (B) velocity
(C) momentum (D) kinetic energy

55. Which of the following sources emits light having highest degree of coherence?
(A) Light emitting diode (B) LASER diode
(C) Neon lamp (D) incandescent lamp

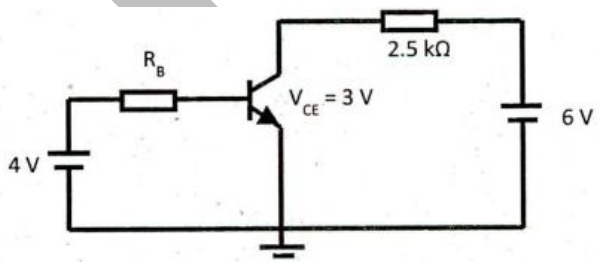
56. An alpha particle with kinetic energy K approaches a stationary nucleus having atomic number Z. The distance of closest approach is b. Therefore the distance of closest approach for a nucleus of atomic number 2Z is
(A) b/Z (B) $\sqrt{2}$ b
(C) 2 b (D) 4 b

57. In a photodiode the reverse current increase when exposed to light of wavelength 620 nm or less. The band gap of the semiconductor used is
(A) 0.067 eV (B) 1.12 eV
(C) 2.00 eV (D) 2.42 eV

58. An electron in hydrogen atom jumps from a level n = 4 to n = 1. The momentum of the recoiled atom is
(A) 6.8×10^{-27} kg -m/s (B) 12.75×10^{-19} kg -m/s
(C) 13.6×10^{-19} kg -m/s (D) zero

59. For the Boolean equation Y = AB + A(B + C) + B(B + C) + $\overline{B}$, which of the following statements is correct?
(A) Y does not depend on A but depends on B
(B) Y does not depend on B but depends on A
(C) Y does not depend on B
(D) Y depends only on C

60. Refer to the common emitter amplifier circuit shown below using a transistor with β = 80 and V_{BE} = 0.7 volt. The value of resistance R_B is



(A) 330 Ω (B) 330 Ω
(C) 220 Ω (D) 220 kΩ

A-2

QUESTIONS WITH MORE THAN ONE OPTION CORRECT

61. A horizontal insulated cylinder of volume V is divided into four identical compartments by stationary semi-permeable thin partitions as shown. The four compartments from left are initially filled with 28 g helium, 160 g oxygen, 28 g nitrogen and 20 g hydrogen respectively. The left partition lets through hydrogen, nitrogen and helium while the right partition lets thorough hydrogen only. The middle partition lets through hydrogen and nitrogen both. The temperature T inside the entire cylinder is maintained constant. After the system is set in equilibrium

He	O_2	N_2	H_2

(A) pressure of helium is $\frac{14RT}{V}$

(B) pressure of oxygen is $\frac{20RT}{V}$

(C) pressure of nitrogen is $\frac{4RT}{3V}$

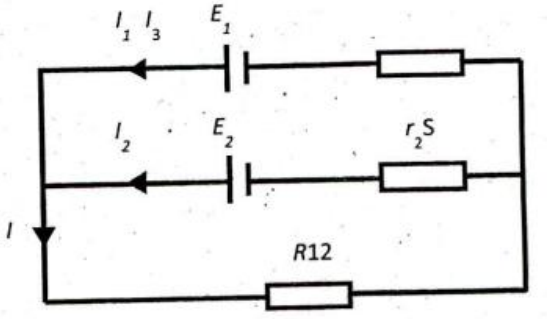
(D) pressure of hydrogen is $\frac{10RT}{V}$

62. After charging a capacitor C to a potential V, it is connected across an ideal inductor L. The capacitor starts discharging simple harmonically at time t= 0. The charge on the capacitor at a later instant is q and the periodic time of simple harmonic oscillations is T. therefore.

(A) $q = CV \sin(\omega t)$ (B) $q = CV \cos(\omega t)$

(C) $T = 2\pi\sqrt{\frac{1}{LC}}$ (D) $T = 2\pi\sqrt{LC}$

63. In the circuit arrangement shown two cells supply a current I to a load resistance R = 9 Ω. One cell has an emf E_1 = 9V and internal resistance r_1 = 1 Ω and the other cell has an emf E_2 = 6 V and internal resistance r_2 = 3 Ω. The currents are as shown, then



(A) I_1 = 0.9 A and I_2 = 0.5 A

(B) $I \cong 0.85A$

(C) if the cell of emf E_1 is removed, current I will be smaller

(D) if the cell of emf E_2 is removed, current I will be smaller

64. A transparent cylindrical rod of length l = 50 cm, radius R = 10 cm and refractive index $\mu = \sqrt{3}$ lies onto a horizontal plane surface. A ray of light moving perpendicular to its length is incident on the rod horizontally at a height h above the plane surface such that this ray emerges out of the rod at a height 10 cm above the plane surface. Therefore h is

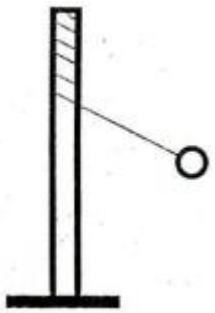
(A) 1.34 cm (B) 1.73 cm

(C) 10.0 cm (D) 18.66 cm

65. Two point charges +1 μC and - 1μC are place at points(0, - 0.1m) and (0, +0.1 m) respectively in XY plane. Then choose the correct statement/s from the following
(A) the electric field at all points on the Y axis has the same direction
(B) the dipole moment is 0.2μC-m along +X axis direction
(C) no work has to be done in bringing a test charge from infinity to the origin
(D) electric field at all points on the X axis is along +Y axis

66. An inductance L, a resistance R and a batter B are connected in series with a switch S. The voltages across L and R are V_L and V_R respectively. Just after closing the switch S
(A) V_L will be greater than V_R
(B) V_L will be less than V_R
(C) V_L will be the same as V_R
(D) V_L will decrease while V_R will increase as time progresses

67. A string of length l, tied to the top of a pole, carries as ball at its end as shown. On giving the ball a single hand blow perpendicular to the string, it acquires an initial velocity v_0 in the horizontal plane and moves in a spiral of decreasing radius by curling itself around the pole. Therefore,



(A) the instantaneous centre of revolution of the ball is the point of contact of the string with the pole at that instant.
(B) the instantaneous centre of revolution of the ball will be fixed at the point where the string was initially fixed.
(C) the angular momentum of the system will not be conserved.
(D) the angular momentum of the system will not conserved.

68. A circular loop of conducting wire or radius 1 cm is cut at a point A on its circumference. It is then folded along a diameter through A such that the two semicircular loops lie in two mutually perpendicular planes. In this region a uniform magnetic field $\vec{B}$ of magnitude 100 mT is directed perpendicular to the diameter through A and makes angles of 30^o and 60^o with the planes of the two semicircles. The magnetic field reduces at a uniform rate from 100 mT to zero in a time interval of 4.28 ms. Therefore
(A) instantaneous emf in the two loops are in the ratio $\sqrt{2}:1$
(B) instantaneous emf in the two loops are in the ratio $\sqrt{3}:1$
(C) the total emf between free ends at point A is 5 mV
(D) the total emf between free ends at point A is 1.4 mV

69. A converging lens of focal length 40 cm is fixed at 40 cm in front of a screen. An object placed 120 cm from the fixed lens is required to be focused on the screen by introducing another identical lens in between. The second lends should be placed at a distance x form the object where x is
(A) 40 cm (B) 50 cm
(C) 140 cm (D) 150 cm

70. Mysteriously a charged particle moving with velocity $\vec{v} = v_0\hat{i}$ entered the tube of Thomson's apparatus where the parallel metallic plates of length 5 cm along X axis are separated by 2 cm. Under the influence of a magnetic field $\vec{B} = \left(4.57 \times 10^{-2}\hat{k}\right)$T, the particle is found to deflect by an angle of 5.7°. When a potential of 2000 volt is applied between the two plates, the particle is found to move straight to the screen without any deflection. Then

(A) the velocity $v_0 = 2.19 \times 10^8$ m/s

(B) the charge to mass ratio of the particle is 9.58×10^7 C/kg

(C) radius of the circular path in the magnetic field is 50 cm

(D) the particle is identified as a proton