AIPMT / NEET - 2016
(Physics, Chemistry and Biology)
Code A/P/W

Time: 3 hrs **Total Marks: 720**

General Instructions:

1. The Answer sheet is inside this Text booklet. When you are directed to open the text booklet, take out the Answer Sheet and fill in the particulars on side-1 and side-2 carefully with blue/black ball point pen only.
2. The test is of 3 hours duration and consists of 180 questions. Each question carries 3 marks. For each correct response the candidate will get 4 marks. For each incorrect response, one mark will be deducted. The maximum marks are 720.
3. Use Blue/Black ball point pen only for writing particulars on this page/marking responses.
4. Rough work is to be done on the space provided for this purpose in the text booklet only.
5. On completion of the test, the candidate must handover the answer sheet to the invigilator in the room/Hall. The candidates are allowed to take away this text booklet with them.
6. Make sure that the CODE printed on side-2 of the answer sheet is the same as that on this booklet, In case of discrepancy, the candidate should immediately report the matter to the invigilator for the replacement of both the test Booklet and the Answer Sheet.
7. The candidates should ensure that the Answer sheet is not folded. Do not make any stray marks on the Answer sheet. Do not write your roll no. anywhere else except in the specified space in the Test booklet/Answer Sheet.
8. Use of white fluid for correction is not permissible on the Answer Sheet.

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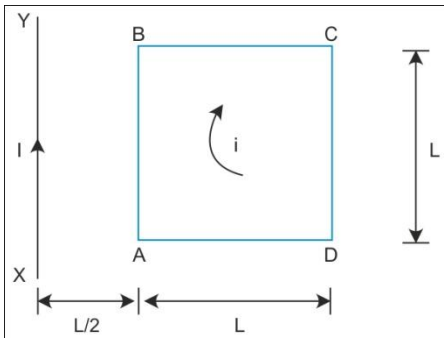
1. From a disc of radius R and mass M. a circular hole diameter R whose rim passes through the centre is cut. What the moment of inertia of the remaining part of the disc about perpendicular axis & passing through the centre?

(1) 15 $MR^2/32$
(2) 13 $MR^2/32$
(3) II MR2/32
(4) 0 MR7/32

2. A square loop ABCD carrying a current i, is placed near and coplanar with a long straight conductor XY carrying a current I. the net force on the loop will be:



(1) $\frac{2\mu_0 Ii}{3\pi}$

(2) $\frac{\mu_0 Ii}{2\pi}$

(3) $\frac{2\mu_0 IiL}{3\pi}$

(4) $\frac{\mu_0 IiL}{2\pi}$

3. The magnetic suscepetibility is negative for

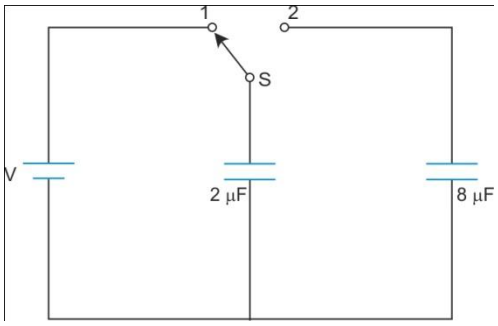
(1) diamagnetic material only
(2) paramagnetic material only
(3) ferromagnetic material only
(4) Paramagnetic and ferromagnetic materials

4. A siren emitting a sound of frequency 800 Hz moves away from an observer towards a cliff at a a speed of 15 ms^{-1}. Then , the frequency of sound that the observer hears in the echo reflected from the cliff is :

(Take velocity of sound in air = 330 ms^{-1})

(1) 765 Hz
(2) 800 Hz
(3) 838 Hz
(4) 885 Hz

5.



A capacitor of 2 μF is charged as shown in the diagram. When the switch S is turn to position 2, the percentage of its stored energy dissipated is:

(1) 0%
(2) 20%
(3) 75%
(4) 80%

6. In a diffraction pattern due to a single slit of width 'a', the first minimum is observed at an angle 30° when light of wavelength 5000 $\mathring{A}$ is incident on the slit. The first secondary maximum is observed at an angle of:

(1) $\sin^{-1}\left(\frac{1}{4}\right)$
(2) $\sin^{-1}\left(\frac{2}{3}\right)$
(3) $\sin^{-1}\left(\frac{1}{2}\right)$
(4) $\sin^{-1}\left(\frac{3}{4}\right)$

7. At what height from the surface of earth the gravitation potential and the value of g are -5.4×10^7 J kg^{-2} and 6.0 ms^{-2} respectively? Take the radius of earth as 6400 km:

(1) 2600 km
(2) 1600 km
(3) 1400 km
(4) 2000 km

8. Out of the following options which one can be used to produce a propagating electromagnetic wave?

(1) A charge moving at constant velocity
(2) A stationary charge
(3) A chargeless particle
(4) An accelerating charge

9. Two identical charged spheres suspended from a common point by two massless strings of lengths l, are initially at a distance d (d << l) apart because of their mutual repulsion. The charges begin to leak from the both the sphere at a constant rate. As a result, the sphere approach each other with a velocity υ. Then ν varies as a function of the distance x between the spheres as :

(1) $\upsilon \propto x^{\frac{1}{2}}$
(2) $\upsilon \propto x$
(3) $\upsilon \propto x^{-\frac{1}{2}}$
(4) $\upsilon \propto x^{-1}$

10. A uniform rope of length L and mass m_1 hangs vertically from a rigid support. A block of mass m_2 is attached to the free end of the rope. A transverse pulse of wavelength λ_1 is produced at the lower end of the rope. The wavelength of the pulse when it reaches the top of the rope is λ_2. The ratio λ_2/λ_1 is:

(1) $\sqrt{\frac{m_1}{m_2}}$
(2) $\sqrt{\frac{m_1+m_2}{m_2}}$
(3) $\sqrt{\frac{m_2}{m_1}}$
(4) $\sqrt{\frac{m_1+m_2}{m_1}}$

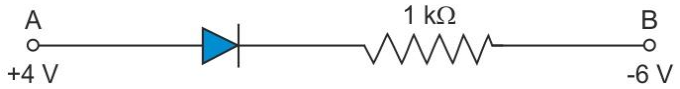
11. A refrigerator works between 4 °C and 30 °C. It is required to remove 600 calories of heat every second in order to keep the temperature of the refrigerated space constant. The power required is:
(Take 1 cal = 4.2 joules)

(1) 2.365 W
(2) 23.65 W
(3) 236.5 W
(4) 2365 W

12. An air column, closed at one end and open at the other, resonates with a turning fork when the smallest length of the column is 50 cm. The next larger length of the column resonating with the same turning fork is:

(1) 66.7 cm
(2) 100 cm
(3) 150 cm
(4) 200 cm

13. Consider the junction diode as ideal. The value of current flowing through AB is:



(1) 0 A
(2) 10^{-2} A
(3) 10^{-1} A
(4) 10^{-3} A

14. The charge flowing through a resistance R varies with time t as $Q = at - bt^2$, where a and b are positive constants. The total heat produced in R is:

(1) $\frac{a^3R}{6b}$
(2) $\frac{a^3R}{3b}$
(3) $\frac{a^3R}{2b}$
(4) $\frac{a^3R}{b}$

15. A black body is at a temperature of 5760 K. The energy of radiation emitted by the body at wavelength 250 nm is U_1. At wavelength 500 nm is U_2 and that at 1000 nm is U_3. Wien's constant, $b = 2.88 \times 10^6$ nmK. Which of the following is correct?

(1) $U_1 = 0$
(2) $U_3 = 0$
(3) $U_1 > U_2$
(4) $U_2 > U_1$

16. Coefficient of linear expansion of brass and steel rods are α_1 and α_2. Lengths of brass and steel rods are l_1 and l_2 respectively. If $(l_2 - l_1)$ is maintained same at all temperatures, which one of the following relations holds good?

(1) $\alpha_1 l_2 = \alpha_2 l_1$

(2) $\alpha_1 l_2^2 = \alpha_2 l_1^2$

(3) $\alpha_1^2 l_2 = \alpha_2^2 l_1$

(4) $\alpha_1 l_1 = \alpha_2 l_2$

17. A npn transistor is connected in common emitter configuration in a given amplifier. A load resistance of 800 Ω is connected in the collector circuit and the voltage drop across it is 0.8 V. Of the current amplification factor is 0.96 and the input resistance of the circuit is 192 Ω, the voltage gain and the power gain of the amplifier will respectively be:

(1) 4, 3.84

(2) 3.69, 3.84

(3) 4, 4

(4) 4, 3.69

18. The intensity of the maximum in a Young's double slit experiment is I_0. Distance between two slits of $d = 5\lambda$, where λ is the wavelength of light used in the experiment. What will be the intensity in front of one of the slits on the screen placed at a distance $D = 10d$?

(1) I_0

(2) $\frac{I_0}{4}$

(3) $\frac{3}{4} I_0$

(4) $\frac{I_0}{2}$

19. A uniform circular disc of radius 50 cm at rest is free to turn about an axis which is perpendicular to its plane and passes through its centre. It is subjected to a torque which produces a constant angular acceleration of 2.0 rad s^{-2}. Its net acceleration in ms^{-2} at the end of 2.0 s is approximately.

(1) 8.0

(2) 7.0

(3) 6.0

(4) 3.0

20. An electron of mass m and a photon have same energy E. The ratio of de-Broglie wavelengths associated with them is :

(1) $\frac{1}{c}\left(\frac{E}{2m}\right)^{\frac{1}{2}}$

(2) $\left(\frac{E}{2m}\right)^{\frac{1}{2}}$

(3) $c(2mE)^{\frac{1}{2}}$

(4) $\frac{1}{c}\left(\frac{2m}{E}\right)^{\frac{1}{2}}$

21. A disk and a sphere o same radius but different masses roll off on two inclined planes of the same altitude and lengths. Which one of the two objects gets to the bottom of the plane first?

(1) Disk
(2) Sphere
(3) Both reach at the same time
(4) Depends on their masses

22. The angle of incidence for a ray light at a refracting surface of a prism is 45°. The angle of prism is 60°. If the ray suffers minimum deviation through the prism, the angle of minimum deviation and refractive index of the material of the prism respectively, are:

(1) 45°; $\frac{1}{\sqrt{2}}$

(2) 30°; $\sqrt{2}$

(3) 45°; $\sqrt{2}$

(4) 30°; $\frac{1}{\sqrt{2}}$

23. When an α - particle of mass 'm' moving with velocity 'υ' bombards on a heavy nucleus of charge 'Ze', its distance of closet approach from the nucleus depends on m as:

(1) $\frac{1}{m}$

(2) $\frac{1}{\sqrt{m}}$

(3) $\frac{1}{m^2}$

(4) M

24. A particle of mass 10 g moves along a circle of radius 6.4 c with a constant tangential acceleration. What is the magnitude of this acceleration if the kinetic energy of the particle becomes equal to 8×10^{-4} J by the end of the second revolution after the beginning of the motion?

(1) 0.1 m/s^2

(2) 0.15 m/s^2

(3) 0.18 m/s^2

(4) 0.2 m/s^2

25. The molecules of a given mass of a gas have r.m.s. velocity of 200 ms^{-1} at 27 °C and 1.0×10^5 Nm^{-2} pressure. When the temperature and pressure of the gas respectively, 127 °C and 0.05×10^5 Nm^{-2}, the r.m.s. velocity of its molecules in ms^{-1} is:

(1) $100\sqrt{2}$

(2) $\frac{400}{\sqrt{3}}$

(3) $\frac{100\sqrt{2}}{3}$

(4) $\frac{100}{3}$

26. A long straight wire of radius a carries a steady current I. The current is uniformly distributed over its cross–section. The ratio of the magnetic fields B and B', at radial distances a/2 and 2a respectively, from the axis of the wire is:

(1) $\frac{1}{4}$

(2) $\frac{1}{2}$

(3) 1

(4) 4

27. A particle moves so that its position vector is given by $\vec{r} = \cos\omega t\,\hat{x} + \sin\omega t\hat{y}$. Where ω is a constant. Which of the following is true?

(1) Velocity and acceleration both are perpendicular to $\vec{r}$

(2) Velocity and acceleration both are parallel to $\vec{r}$

(3) Velocity is perpendicular to $\vec{r}$ and acceleration is directed towards the origin.

(4) Velocity is perpendicular to $\vec{r}$ and acceleration is directed away from the origin.

28. What is the minimum velocity with which a body of mass m must enter a vertical loop of radius R so that it can complete the loop?

(1) $\sqrt{gR}$

(2) $\sqrt{2gR}$

(3) $\sqrt{3gR}$

(4) $\sqrt{5gR}$

29. When a metallic surface is illuminated with radiation of wavelength λ, the stopping potential is V. If the same surface is illuminated with radiation of wavelength 2λ, the stopping potential is $\frac{V}{4}$. The threshold wavelength for the metallic surface is:

(1) 4λ

(2) 5λ

(3) $\frac{5}{2}\lambda$

(4) 3λ

30. A gas is compressed is isothermally to half its initial volume. The same gas is compressed separately through and adiabatic process until its volume is again reduced to half. Then:

(1) Compressing the gas isothermally will require more work to be done.

(2) Compressing the gas through adiabatic process will require more work to be done

(3) Compressing the gas isothermally of adiabatically will require the same amount or work

(4) Which of the case (wheather compression through isothermal or through adiabatic process) requires more work will depend upon the atomicty of the gas.

31. A potentiometer wire is 100 cm long and a constant potential difference is maintained across it. Two cells are connected in series first to support one another and then in opposite direction. The balance points are obtained at 50 cm and 10 cm from the positive end of the wire in the two cases. The ratio of emf's is

(1) 5:1

(2) 5:4

(3) 3:4

(4) 3:2

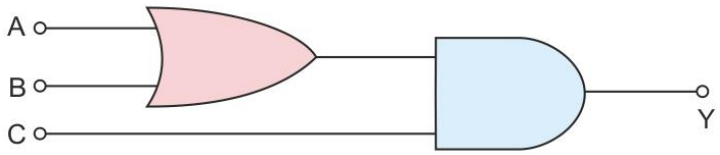
32. A astronomical telescope has objective and eyepiece of focal lengths 40 cm and 4 cm respectively. To view an object 200 cm away from the objective, the lenses must be separated by a distance

(1) 37.3 cm
(2) 46.0 cm
(3) 50.0 cm
(4) 54.0 cm

33. Two non-mixing liquids of densities ρ and $n\rho$ $(n > 1)$ are put in a container. The height of each liquids is h. A solid cylinder of length L and density d is put in this container. The cylinder floats with its axis vertical and length pL $(p < 1)$ in the denser liquids. The density d is equal to

(1) $\{1+(n+1)p\}p$
(2) $\{2+(n+1)p\}p$
(3) $\{2+\{n-1\}p\}p$
(4) $\{1+(n-1)p\}p$

34. To get output 1 for the following circuit, the correct choice for the input is:



(1) A = 0, B = 1, C = 0
(2) A = 1, B = 0, C = 0
(3) A = 1, B = 1, C = 0
(4) A = 1, B = 0, C = 1

35. A piece of ice falls from a height h so that it melts completely. Only one – quarter of the heat produced is absorbed by the ice and all the energy of ice gets converted into heat during its fall. The value of h is: [Latent heat of ice is 3.4×10^5 J/kg and g = 10 N/kg]

(1) 34km
(2) 544 km
(3) 136 km
(4) 68 km

36. The ratio of escape velocity of earth (υ_υ) to the escape velocity at a planet (υ_p) whose radius and mean density are twice as that of earth is:

(1) 1 : 2
(2) $1:2\sqrt{2}$
(3) 1:4
(4) $1:\sqrt{2}$

37. If the magnitude of sum of two vectors is equal to the magnitude of difference of the two vectors, the angle between these vectors is:

(1) 0°
(2) 90°
(3) 45°
(4) 180°

38. Given the value of Rydberg constant is $10^7\ m^{-1}$, the wave number of the last line of the Balmer series in hydrogen spectrum will be:

(1) $0.025 \times 10^4\ m^{-1}$
(2) $0.5 \times 10^7\ m^{-1}$
(3) $0.25 \times 10^7\ m^{-1}$
(4) $2.5 \times 10^7\ m^{-1}$

39. A body of mass 1 kg begins to move under the action of a time dependent force $\vec{F}=(2t\hat{i}+3t^2\hat{j})N$, where $\hat{i}$ and $\hat{j}$ are unit along x and y axis. What power will be developed by the force at the time t?

(1) $(2t^2 + 3t^3)$ W
(2) $(2t^2 + 4t^4)$ W
(3) $(2t^3 + 3t^4)$ W
(4) $(2t^3 + 3t^5)$ W

40. An inductor 20 mH, a capacitor 50 μF and a resistor 40 Ω are connected in series across a source of emf V = 10 sin 340t. The power loss in A.C circuit is:

(1) 0.51 W
(2) 0.67 W
(3) 0.76 W
(4) 0.89 W

41. If the velocity of a particle is $\upsilon = At + Bt^2$, where A and B are constants, then the distance travelled by it between is and 2s is:

(1) $\frac{3}{2}A+4B$
(2) $3A + 7B$
(3) $\frac{3}{2}A+\frac{7}{3}B$
(4) $\frac{A}{2}+\frac{B}{3}$

42. A long solenoid has 1000 turns. When a current of 4A flows through it, the magnetic flux linked with each turn of the solenoid is 4×10^{-3} Wb. The self–inductance of the solenoid is:

(1) 4H
(2) 3H
(3) 2H
(4) 1H

43. A small signal voltage $V(t) = V_0 \sin \omega t$ is applied across an ideal capacitor C:

(1) Current I(t), lags voltage V(t) by 90^o.
(2) Over a full cycle the capacitor C does not consume any energy from the voltage source.
(3) Current I(t) is in phase with voltage V(t)
(4) Current I(t) leads voltage V(t) by 180^o

44. Match the corresponding entries of column 1 with column 2 [where m is the magnification produced by the mirror]

	Column 1	Column 2
(A)	$m = -2$	(a) Convex mirror
(B)	$m = -\frac{1}{2}$	(b) Concave mirror
(C)	$m = +2$	(c) Real image
(D)	$m = +\frac{1}{2}$	(d) Virtual image

(1) A → b and c; B → b and c; C → b and d; D → a and d
(2) A → a and c; B → a and d; C → a and b; D → c and d
(3) A → a and d; B → b and c; C → b and d; D → b and c
(4) A → c and d; B → b and d; C → b and c; D → a and d

45. A car is negotiating a curved road of radius R. The road is banked at an angle θ. The coefficient of friction between the types of the car and the road is μ_s. The maximum safe velocity on this road is:

(1) $\sqrt{gR^2 \frac{\mu_s + \tan\theta}{1 - \mu_s \tan\theta}}$
(2) $\sqrt{gR \frac{\mu_s + \tan\theta}{1 - \mu_s \tan\theta}}$
(3) $\sqrt{\frac{g}{R} \frac{\mu_s + \tan\theta}{1 - \mu_s \tan\theta}}$
(4) $\sqrt{\frac{g}{R^2} \frac{\mu_s + \tan\theta}{1 - \mu_s \tan\theta}}$