

**NEET-UG 2016 PHASE I
BOOKLET CODE- D
(PHYSICS)**

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1. A siren emitting a sound of frequency 800 Hz moves away from an observer towards a cliff at 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) 838 Hz
 (2) 885 Hz
 (3) 765 Hz
 (4) 800 Hz
2. Out of the following options which one can be used to produce a propagating electromagnetic wave ?
- (1) A chargeless particle
 (2) An accelerating charge
 (3) A charge moving at constant velocity
 (4) A stationary charge

3. An inductor 20 mH, a capacitor $50 \mu\text{F}$ and a resistor 40Ω are connected in series across a source of emf $V = 10 \sin 340 t$. The power loss in A.C. circuit is :

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

4. 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 \rightarrow a and d; B \rightarrow b and c; C \rightarrow b and d; D \rightarrow b and c

(2) A \rightarrow c and d; B \rightarrow b and d; C \rightarrow b and c; D \rightarrow a and d

(3) A \rightarrow b and c; B \rightarrow b and c; C \rightarrow b and d; D \rightarrow a and d

(4) A \rightarrow a and c; B \rightarrow a and d; C \rightarrow a and b; D \rightarrow c and d

5. 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) $\alpha_1^2 l_2 = \alpha_2^2 l_1$

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

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

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

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

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

7. 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 energy of ice gets converted into heat during its fall. The value of h is : [Latent heat of ice is $3.4 \times 10^5 \text{ J/kg}$ and $g = 10 \text{ N/kg}$]

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

8. 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 \AA is incident on the slit. The first secondary maximum is observed at an angle of :

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

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

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

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

8. 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) 3 : 4
 (2) 3 : 2
 (3) 5 : 1
 (4) 5 : 4

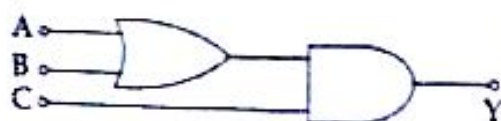
10. A particle of mass 10 g moves along a circle of radius 6.4 cm with a constant tangential acceleration. What is the magnitude of this acceleration if the kinetic energy of the particle becomes equal to 8×10^{-4} J by the end of the second revolution after the beginning of the motion?

- (1) 0.18 m/s²
 (2) 0.2 m/s²
 (3) 0.1 m/s²
 (4) 0.15 m/s²

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

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

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



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

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

- (1) Compressing the gas isothermally or adiabatically will require the same amount of work.
 (2) Which of the case (whether compression through isothermal or through adiabatic process) requires more work will depend upon the atomicity of the gas.
 (3) Compressing the gas isothermally will require more work to be done.
 (4) Compressing the gas through adiabatic process will require more work to be done.

14. The intensity at the maximum in a Young's double slit experiment is I_0 . Distance between two slits is $d = 5\lambda$, 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) $\frac{3}{4} I_0$
 (2) $\frac{I_0}{2}$
 (3) I_0
 (4) $\frac{I_0}{4}$

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

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

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

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

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

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

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

(c being velocity of light)

17. 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) $U_1 > U_2$

(2) $U_2 > U_1$

(3) $U_1 = 0$

(4) $U_3 = 0$

18. 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) $0.25 \times 10^7 \text{ m}^{-1}$

(2) $2.5 \times 10^7 \text{ m}^{-1}$

(3) $0.025 \times 10^4 \text{ m}^{-1}$

(4) $0.5 \times 10^7 \text{ m}^{-1}$

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

(1) 4, 4

(2) 4, 3.69

(3) 4, 3.84

(4) 3.69, 3.84

20. Two non-mixing liquids of densities ρ and $n\rho$ ($n > 1$) are put in a container. The height of each liquid 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 liquid. The density d is equal to :

(1) $[2 + (n-1)p]\rho$

(2) $[1 + (n-1)p]\rho$

(3) $[1 + (n+1)p]\rho$

(4) $[2 + (n+1)p]\rho$

21. If the velocity of a particle is $v = At + Bt^2$, where A and B are constants, then the distance travelled by it between 1s and 2s is :

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

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

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

(4) $3A + 7B$

22. 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) 50.0 cm

(2) 54.0 cm

(3) 37.3 cm

(4) 46.0 cm

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

(1) 1 : 4

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

(3) 1 : 2

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

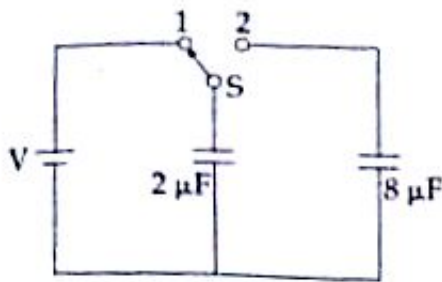
24. A long straight wire of radius a carries a steady current I . The current is uniformly distributed over its cross-section. The ratio of the magnetic fields B and B' , at radial distances $\frac{a}{2}$ and $2a$ respectively, from the axis of the wire is :

(1) 1

(2) 4

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

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



25. A capacitor of $2 \mu\text{F}$ is charged as shown in the diagram. When the switch S is turned to position 2, the percentage of its stored energy dissipated is :

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

26. 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) $\frac{5}{2} \lambda$
- (2) 3λ
- (3) 4λ
- (4) 5λ

27. 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) 45°
- (2) 180°
- (3) 0°
- (4) 90°

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

- (1) $(2t^3 + 3t^4) \text{ W}$
- (2) $(2t^3 + 3t^5) \text{ W}$
- (3) $(2t^2 + 3t^3) \text{ W}$
- (4) $(2t^2 + 4t^3) \text{ W}$

29.

The angle of incidence for a ray of 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) $45^\circ; \sqrt{2}$
- (2) $30^\circ; \frac{1}{\sqrt{2}}$
- (3) $45^\circ; \frac{1}{\sqrt{2}}$
- (4) $30^\circ; \sqrt{2}$

30.

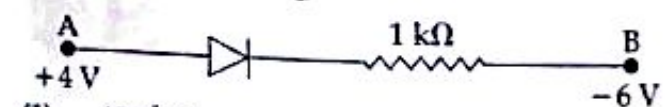
A particle moves so that its position vector is given by $\vec{r} = \cos \omega t \hat{x} + \sin \omega t \hat{y}$. Where ω is a constant.

Which of the following is true ?

- (1) Velocity is perpendicular to \vec{r} and acceleration is directed towards the origin.
- (2) Velocity is perpendicular to \vec{r} and acceleration is directed away from the origin.
- (3) Velocity and acceleration both are perpendicular to \vec{r} .
- (4) Velocity and acceleration both are parallel to \vec{r} .

31.

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



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

32.

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 both the spheres at a constant rate. As a result, the spheres approach each other with a velocity v . Then v varies as a function of the distance x between the spheres, as :

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

D

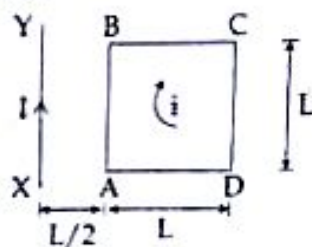
33. A small signal voltage $V(t) = V_0 \sin \omega t$ is applied across an ideal capacitor C :

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

34. The magnetic susceptibility is negative for:

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

35. 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) $\frac{2\mu_0 i I L}{3\pi}$
- (2) $\frac{\mu_0 i I L}{2\pi}$
- (3) $\frac{2\mu_0 i I}{3\pi}$
- (4) $\frac{\mu_0 i I}{2\pi}$

36. 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) $\sqrt{\frac{m_2}{m_1}}$
- (2) $\sqrt{\frac{m_1 + m_2}{m_1}}$
- (3) $\sqrt{\frac{m_1}{m_2}}$
- (4) $\sqrt{\frac{m_1 + m_2}{m_2}}$

6

37.

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

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

38.

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

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

39.

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

- (1) $11 MR^2/32$
- (2) $9 MR^2/32$
- (3) $15 MR^2/32$
- (4) $13 MR^2/32$

40.

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

41.

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) $\sqrt{3gR}$
- (2) $\sqrt{5gR}$
- (3) \sqrt{gR}
- (4) $\sqrt{2gR}$

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

- (1) $\frac{100\sqrt{2}}{3}$
- (2) $\frac{100}{3}$
- (3) $100\sqrt{2}$
- (4) $\frac{400}{\sqrt{3}}$

43. 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) $\frac{a^3R}{2b}$
- (2) $\frac{a^3R}{b}$
- (3) $\frac{a^3R}{6b}$
- (4) $\frac{a^3R}{3b}$

44. 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 $1 \text{ cal} = 4.2 \text{ Joules}$)

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

45. 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) 6.0
- (2) 3.0
- (3) 8.0
- (4) 7.0

46. Which of the following would appear as the pioneer organisms on bare rocks ?

- (1) Mosses
- (2) Green algae
- (3) Lichens
- (4) Liverworts

47. Water vapour comes out from the plant leaf through the stomatal opening. Through the same stomatal opening carbon dioxide diffuses into the plant during photosynthesis. Reason out the above statements using one of following options.

- (1) The above processes happen only during night time.
- (2) One process occurs during day time, and the other at night.
- (3) Both processes cannot happen simultaneously.
- (4) Both processes can happen together because the diffusion coefficient of water and CO_2 is different.

48. Lack of relaxation between successive stimuli in sustained muscle contraction is known as :

- (1) Tetanus
- (2) Tonus
- (3) Spasm
- (4) Fatigue

49. Depletion of which gas in the atmosphere can lead to an increased incidence of skin cancers :

- (1) Ammonia
- (2) Methane
- (3) Nitrous oxide
- (4) Ozone

50. Nomenclature is governed by certain universal rules. Which one of the following is contrary to the rules of nomenclature ?

- (1) The names are written in Latin and are italicised
- (2) When written by hand, the names are to be underlined
- (3) Biological names can be written in any language
- (4) The first word in a biological name represents the genus name, and the second is a specific epithet