NEET 2024 — Physics Question Paper with Solutions

33 Physics questions as set in the paper · answers checked by RankUp

NEET 2024

1. In a vernier callipers, (N + 1) divisions of vernier scale coincide with N divisions of main scale. If 1 MSD represents 0.1 mm, the vernier constant (in cm) is:

(A) 1/(10N)
(B) 1/(100(N + 1))
(C) 100N
(D) 10(N + 1)

NEET 2024

2. If the monochromatic source in Young's double slit experiment is replaced by white light, then

(A) Interference pattern will disappear
(B) There will be a central dark fringe surrounded by a few coloured fringes
(C) There will be a central bright white fringe surrounded by a few coloured fringes
(D) All bright fringes will be of equal width

NEET 2024

3. A logic circuit provides the output Y as per the following truth table :

A B Y
0 0 1
0 1 0
1 0 1
1 1 0

The expression of the output Y is :

(A) $A \cdot B + \bar{A}$
(B) $A \cdot \bar{B} + \bar{A}$
(C) $\bar{B}$
(D) B

NEET 2024

4. A wire of length 'l' and resistance 100 Ω is divided into 10 equal parts. The first 5 parts are connected in series while the next 5 parts are connected in parallel. The two combinations are again connected in series. The resistance of this final combination is:

(A) 26 Ω
(B) 52 Ω
(C) 55 Ω
(D) 60 Ω

NEET 2024

5. A tightly wound 100 turns coil of radius 10 cm carries a current of 7 A. The magnitude of the magnetic field at the centre of the coil is (Take permeability of free space as $4\pi \times 10^{-7}$ SI units):

(A) 44 mT
(B) 4.4 T
(C) 4.4 mT
(D) 44 T

NEET 2024

6. In an ideal transformer, the turns ratio is $N_P/N_S = 1/2$. The ratio $V_S : V_P$ is equal to (the symbols carry their usual meaning) :

(A) 1 : 2
(B) 2 : 1
(C) 1 : 1
(D) 1 : 4

NEET 2024

7. A bob is whirled in a horizontal plane by means of a string with an initial speed of ω rpm. The tension in the string is T. If speed becomes 2ω while keeping the same radius, the tension in the string becomes:

(A) T
(B) 4T
(C) T/4
(D) √2 T

NEET 2024

8. The moment of inertia of a thin rod about an axis passing through its mid point and perpendicular to the rod is 2400 g cm². The length of the 400 g rod is nearly:

(A) 8.5 cm
(B) 17.5 cm
(C) 20.7 cm
(D) 72.0 cm

NEET 2024

9. A particle moving with uniform speed in a circular path maintains:

(A) Constant velocity
(B) Constant acceleration
(C) Constant velocity but varying acceleration
(D) Varying velocity and varying acceleration

NEET 2024

10. If c is the velocity of light in free space, the correct statements about photon among the following are:

A. The energy of a photon is $E = h\nu$.
B. The velocity of a photon is c.
C. The momentum of a photon, $p = h\nu/c$.
D. In a photon-electron collision, both total energy and total momentum are conserved.
E. Photon possesses positive charge.
Choose the correct answer from the options given below:

(A) A and B only
(B) A, B, C and D only
(C) A, C and D only
(D) A, B, D and E only

NEET 2024

11. At any instant of time t, the displacement of any particle is given by $2t - 1$ (SI unit) under the influence of force of 5 N. The value of instantaneous power is (in SI unit):

(A) 10
(B) 5
(C) 7
(D) 6

NEET 2024

12. The quantities which have the same dimensions as those of solid angle are:

(A) strain and angle
(B) stress and angle
(C) strain and arc
(D) angular speed and stress

NEET 2024

13. The maximum elongation of a steel wire of 1 m length if the elastic limit of steel and its Young's modulus, respectively, are 8×10^8 N m^{-2} and 2×10^{11} N m^{-2}, is:

(A) 4 mm
(B) 0.4 mm
(C) 40 mm
(D) 8 mm

NEET 2024

14. The mass of a planet is 1/10th that of the earth and its diameter is half that of the earth. The acceleration due to gravity on that planet is:

(A) 19.6 m s^{-2}
(B) 9.8 m s^{-2}
(C) 4.9 m s^{-2}
(D) 3.92 m s^{-2}

NEET 2024

15. Match List I with List II:

List I (Spectral Lines of Hydrogen for transitions from): A. $n_2 = 3$ to $n_1 = 2$ B. $n_2 = 4$ to $n_1 = 2$ C. $n_2 = 5$ to $n_1 = 2$ D. $n_2 = 6$ to $n_1 = 2$

List II (Wavelengths (nm)): I. 410.2 II. 434.1 III. 656.3 IV. 486.1

Choose the correct answer from the options given below:

(A) A-II, B-I, C-IV, D-III
(B) A-III, B-IV, C-II, D-I
(C) A-IV, B-III, C-I, D-II
(D) A-I, B-II, C-III, D-IV

NEET 2024

16. An unpolarised light beam strikes a glass surface at Brewster's angle. Then

(A) The reflected light will be partially polarised.
(B) The refracted light will be completely polarised.
(C) Both the reflected and refracted light will be completely polarised.
(D) The reflected light will be completely polarised but the refracted light will be partially polarised.

NEET 2024

17. Match List I with List II

List I (Material): A. Diamagnetic B. Ferromagnetic C. Paramagnetic D. Non-magnetic

List II (Susceptibility (χ)): I. $\chi = 0$ II. $0 > \chi \geq -1$ III. $\chi >> 1$ IV. $0 < \chi < \varepsilon$ (a small positive number)

Choose the correct answer from the options given below.

(A) A-II, B-III, C-IV, D-I
(B) A-II, B-I, C-III, D-IV
(C) A-III, B-II, C-I, D-IV
(D) A-IV, B-III, C-II, D-I

NEET 2024

18. Two bodies A and B of same mass undergo completely inelastic one dimensional collision. The body A moves with velocity v_1 while body B is at rest before collision. The velocity of the system after collision is v_2. The ratio $v_1 : v_2$ is

(A) 1 : 2
(B) 2 : 1
(C) 4 : 1
(D) 1 : 4

NEET 2024

19. $^{290}_{82}X \xrightarrow{\alpha} Y \xrightarrow{e^+} Z \xrightarrow{\beta^-} P \xrightarrow{e^-} Q$

In the nuclear emission stated above, the mass number and atomic number of the product Q respectively, are

(A) 280, 81
(B) 286, 80
(C) 288, 82
(D) 286, 81

NEET 2024

20. If $x = 5 \sin(\pi t + \pi/3)$ m represents the motion of a particle executing simple harmonic motion, the amplitude and time period of motion, respectively, are

(A) 5 cm, 2 s
(B) 5 m, 2 s
(C) 5 cm, 1 s
(D) 5 m, 1 s

NEET 2024

21. A thin flat circular disc of radius 4.5 cm is placed gently over the surface of water. If surface tension of water is 0.07 N m^{-1}, then the excess force required to take it away from the surface is

(A) 19.8 mN
(B) 198 N
(C) 1.98 mN
(D) 99 N

NEET 2024

22. Given below are two statements: one is labelled as Assertion A and the other is labelled as Reason R.

Assertion A: The potential (V) at any axial point, at 2 m distance (r) from the centre of the dipole of dipole moment vector P of magnitude, 4×10^{-6} C m, is $\pm 9 \times 10^3$ V. (Take $1/(4\pi\varepsilon_0) = 9 \times 10^9$ SI units)

Reason R: $V = \pm 2P/(4\pi\varepsilon_0 r^2)$, where r is the distance of any axial point, situated at 2 m from the centre of the dipole.

In the light of the above statements, choose the correct answer from the options given below:

(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true and R is NOT the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

NEET 2024

23. A parallel plate capacitor is charged by connecting it to a battery through a resistor. If I is the current in the circuit, then in the gap between the plates:

(A) There is no current
(B) Displacement current of magnitude equal to I flows in the same direction as I
(C) Displacement current of magnitude equal to I flows in a direction opposite to that of I
(D) Displacement current of magnitude equal to I flows but can be in any direction

NEET 2024

24. The property which is not of an electromagnetic wave travelling in free space is that:

(A) They are transverse in nature
(B) The energy density in electric field is equal to energy density in magnetic field
(C) They travel with a speed equal to $1/\sqrt{(\mu_0\varepsilon_0)}$
(D) They originate from charges moving with uniform speed

NEET 2024

25. A small telescope has an objective of focal length 140 cm and an eye piece of focal length 5.0 cm. The magnifying power of telescope for viewing a distant object is:

(A) 34
(B) 28
(C) 17
(D) 32

NEET 2024

26. Two heaters A and B have power rating of 1 kW and 2 kW, respectively. Those two are first connected in series and then in parallel to a fixed power source. The ratio of power outputs for these two cases is:

(A) 1 : 1
(B) 2 : 9
(C) 1 : 2
(D) 2 : 3

NEET 2024

27. If the mass of the bob in a simple pendulum is increased to thrice its original mass and its length is made half its original length, then the new time period of oscillation is x/2 times its original time period. Then the value of x is:

(A) √3
(B) √2
(C) 2√3
(D) 4

NEET 2024

28. The minimum energy required to launch a satellite of mass m from the surface of earth of mass M and radius R in a circular orbit at an altitude of 2R from the surface of the earth is:

(A) 5GmM/(6R)
(B) 2GmM/(3R)
(C) GmM/(2R)
(D) GmM/(3R)

NEET 2024

29. A sheet is placed on a horizontal surface in front of a strong magnetic pole. A force is needed to:
A. hold the sheet there if it is magnetic.
B. hold the sheet there if it is non-magnetic.
C. move the sheet away from the pole with uniform velocity if it is conducting.
D. move the sheet away from the pole with uniform velocity if it is both, non-conducting and non-polar.
Choose the correct statement(s) from the options given below:

(A) B and D only
(B) A and C only
(C) A, C and D only
(D) C only

NEET 2024

30. A metallic bar of Young's modulus, 0.5×10^{11} N m^{-2} and coefficient of linear thermal expansion 10^{-5} °C^{-1}, length 1 m and area of cross-section 10^{-3} m^2 is heated from 0°C to 100°C without expansion or bending. The compressive force developed in it is :

(A) 5×10^3 N
(B) 50×10^3 N
(C) 100×10^3 N
(D) 2×10^3 N

NEET 2024

31. An iron bar of length L has magnetic moment M. It is bent at the middle of its length such that the two arms make an angle 60° with each other. The magnetic moment of this new magnet is :

(A) M
(B) M/2
(C) 2M
(D) M/√3

NEET 2024

32. If the plates of a parallel plate capacitor connected to a battery are moved close to each other, then
A. the charge stored in it, increases.
B. the energy stored in it, decreases.
C. its capacitance increases.
D. the ratio of charge to its potential remains the same.
E. the product of charge and voltage increases.
Choose the most appropriate answer from the options given below:

(A) A, B and E only
(B) A, C and E only
(C) B, D and E only
(D) A, B and C only

NEET 2024

33. A force defined by $F = \alpha t^2 + \beta t$ acts on a particle at a given time t. The factor which is dimensionless, if α and β are constants, is:

(A) βt/α
(B) αt/β
(C) αβt
(D) αβ/t

Answer key and explanations

1. Answer: (B) 1/(100(N + 1))

(N + 1) VSD = N MSD, so 1 VSD = N/(N + 1) MSD. Vernier constant = 1 MSD − 1 VSD = MSD/(N + 1) = 0.1 mm/(N + 1) = 0.01 cm/(N + 1) = 1/(100(N + 1)) cm. Using N instead of N + 1 in the denominator is the usual slip.

2. Answer: (C) There will be a central bright white fringe surrounded by a few coloured fringes

At the centre the path difference is zero for every wavelength, so all colours interfere constructively and the central fringe is bright white. Away from the centre, fringe widths differ for different wavelengths, so only a few coloured fringes are seen before they overlap into uniform illumination. The pattern does not disappear and fringe widths are not equal.

3. Answer: (C) $\bar{B}$

Y is 1 exactly when B = 0 and 0 when B = 1, whatever A is, so Y = $\bar{B}$. Check $A \cdot B + \bar{A}$: for A = 1, B = 0 it gives 0, but the table shows 1. $A \cdot B + \bar{A}$ gives 1 for A = 0, B = 1, but the table shows 0.

4. Answer: (B) 52 Ω

Each part is 10 Ω. Five in series give 50 Ω; five in parallel give 10/5 = 2 Ω. In series the total is 50 + 2 = 52 Ω.

5. Answer: (C) 4.4 mT

$B = \mu_0 NI/(2R) = 4\pi \times 10^{-7} \times 100 \times 7/(2 \times 0.10) = 8.796 \times 10^{-4}/0.2 \approx 4.4 \times 10^{-3}$ T = 4.4 mT. Forgetting to convert the radius to metres or the factor 2 gives the larger values.

6. Answer: (B) 2 : 1

For an ideal transformer $V_S/V_P = N_S/N_P = 2/1$, so $V_S : V_P = 2 : 1$ (a step-up transformer). Writing the turns ratio as given (1 : 2) inverts the answer.

7. Answer: (B) 4T

The tension provides the centripetal force: $T = m\omega^2 r$. Doubling ω at the same radius multiplies the tension by $2^2 = 4$, giving 4T. A linear dependence would wrongly give 2T.

8. Answer: (A) 8.5 cm

$I = ML^2/12$, so $L^2 = 12I/M = 12 \times 2400/400 = 72$ cm², $L = \sqrt{72} \approx 8.5$ cm. The value 72.0 cm is L^2 mistaken for L; 17.5 cm and 20.7 cm come from using the end-axis formula or other errors.

9. Answer: (D) Varying velocity and varying acceleration

In uniform circular motion the speed is constant but the direction of velocity changes continuously, so velocity varies. The centripetal acceleration has constant magnitude v^2/r but always points towards the centre, so its direction (and hence the acceleration vector) also varies.

10. Answer: (B) A, B, C and D only

A photon has energy hν, travels at c in free space, has momentum hν/c, and in photon–electron collisions (Compton-type) total energy and momentum are conserved. A photon is electrically neutral, so the statement about positive charge is false; the correct set is the first four statements.

11. Answer: (A) 10

Velocity $v = d(2t - 1)/dt = 2$ m s^{-1}. Power $P = F \cdot v = 5 \times 2 = 10$ W. Using the displacement value instead of its derivative gives a time-dependent wrong answer.

12. Answer: (A) strain and angle

Solid angle (area/r^2) is dimensionless. Strain (change in length/length) and plane angle (arc/radius) are also dimensionless. Stress has dimensions $[ML^{-1}T^{-2}]$, arc has [L] and angular speed has $[T^{-1}]$, so the other pairings fail.

13. Answer: (A) 4 mm

Maximum strain = stress/Y = $8 \times 10^8/2 \times 10^{11} = 4 \times 10^{-3}$. Maximum elongation = strain × L = $4 \times 10^{-3} \times 1$ m = 4×10^{-3} m = 4 mm.

14. Answer: (D) 3.92 m s^{-2}

$g = GM/R^2$, so $g_p/g_e = (M_p/M_e)(R_e/R_p)^2 = (1/10) \times 2^2 = 0.4$. $g_p = 0.4 \times 9.8 = 3.92$ m s^{-2}. Using the diameter ratio without squaring gives 1.96 m s^{-2}, and ignoring the mass gives 39.2 m s^{-2}.

15. Answer: (B) A-III, B-IV, C-II, D-I

These are Balmer lines; a larger jump to n = 2 releases more energy and gives a shorter wavelength. So 3→2 is the longest, 656.3 nm (Hα); 4→2 is 486.1 nm; 5→2 is 434.1 nm; 6→2 is 410.2 nm. (Check: $1/\lambda = R(1/4 - 1/9)$ gives 656 nm for 3→2.)

16. Answer: (D) The reflected light will be completely polarised but the refracted light will be partially polarised.

At Brewster's angle the reflected and refracted rays are perpendicular, and the component of the electric field in the plane of incidence is not reflected at all, so the reflected light is completely plane polarised. The refracted beam still contains both components (with less of the perpendicular one), so it is only partially polarised.

17. Answer: (A) A-II, B-III, C-IV, D-I

Diamagnetic materials have small negative susceptibility ($-1 \le \chi < 0$, with -1 for a superconductor). Ferromagnetic materials have very large positive χ. Paramagnetic materials have small positive χ, and a non-magnetic material has $\chi = 0$.

18. Answer: (B) 2 : 1

Momentum is conserved: $m \cdot v_1 + 0 = 2m \cdot v_2$, so $v_2 = v_1/2$ and $v_1 : v_2 = 2 : 1$. The ratio 1 : 2 is inverted, and 4 : 1 would come from wrongly conserving kinetic energy in a form that is not valid for an inelastic collision.

19. Answer: (D) 286, 81

α emission: $A - 4$, $Z - 2 \rightarrow {}^{286}_{80}Y$. Positron emission: $Z - 1 \rightarrow {}^{286}_{79}Z$. β^- emission: $Z + 1 \rightarrow {}^{286}_{80}P$. Emission of another electron: $Z + 1 \rightarrow {}^{286}_{81}Q$. Mass number stays 286 after the α step since e^+ and e^- carry no nucleons, so Q has A = 286 and Z = 81.

20. Answer: (B) 5 m, 2 s

Comparing with $x = A \sin(\omega t + \varphi)$: A = 5 m and $\omega = \pi$ rad/s, so $T = 2\pi/\omega = 2$ s. The displacement is in metres, so 5 cm is wrong, and T = 1 s would need $\omega = 2\pi$.

21. Answer: (A) 19.8 mN

Surface tension acts along the circumference of the disc where it touches water: $F = S \times 2\pi r = 0.07 \times 2\pi \times 0.045 = 0.0198$ N ≈ 19.8 mN. Forgetting to convert cm to m gives the large newton values.

22. Answer: (C) A is true but R is false.

On the axis (r much larger than the dipole length) $V = \pm P/(4\pi\varepsilon_0 r^2) = \pm 9 \times 10^9 \times 4 \times 10^{-6}/4 = \pm 9 \times 10^3$ V, so the assertion is true. The reason puts a factor 2 in the potential; $2P/(4\pi\varepsilon_0 r^3)$ is the axial field form, and with the factor 2 the potential would be $\pm 1.8 \times 10^4$ V, so the reason is false.

23. Answer: (B) Displacement current of magnitude equal to I flows in the same direction as I

While charging, the changing electric field between the plates gives a displacement current $I_d = \varepsilon_0 d\Phi_E/dt = dq/dt$, equal to the conduction current I and in the same direction, so total current is continuous. There is no conduction current in the gap, but saying there is no current at all ignores the displacement current.

24. Answer: (D) They originate from charges moving with uniform speed

Electromagnetic waves are produced by accelerated charges; a charge moving with uniform velocity produces steady fields and does not radiate. The other statements are true: EM waves are transverse, the electric and magnetic energy densities are equal, and their speed in free space is $1/\sqrt{(\mu_0\varepsilon_0)}$.

25. Answer: (B) 28

For normal adjustment (final image at infinity), $m = f_o/f_e = 140/5.0 = 28$. The value 32 would apply for final image at the near point, $m = (f_o/f_e)(1 + f_e/D) = 28 \times 1.2 = 33.6$, which is not intended for a distant object in normal adjustment.

26. Answer: (B) 2 : 9

$R = V^2/P$, so $R_A = V^2/1000$ and $R_B = V^2/2000$. In series $P_s = V^2/(R_A + R_B) = 1/(1/1000 + 1/2000) = 2000/3$ W ≈ 0.667 kW. In parallel $P_p = 1 + 2 = 3$ kW. Ratio $P_s : P_p = (2/3) : 3 = 2 : 9$.

27. Answer: (B) √2

$T = 2\pi\sqrt{(L/g)}$ does not depend on the bob's mass. Halving L gives $T' = T/\sqrt{2} = (\sqrt{2}/2)T$. Comparing with $T' = (x/2)T$ gives $x = \sqrt{2}$. Including the mass (factor √3) is the trap.

28. Answer: (A) 5GmM/(6R)

At altitude 2R the orbit radius is 3R, and the total energy in orbit is $-GMm/(2 \times 3R) = -GMm/(6R)$. On the surface the energy is $-GMm/R$. Energy required $= -GMm/(6R) + GMm/R = 5GMm/(6R)$. Counting only the potential energy change gives $2GMm/(3R)$, which ignores the orbital kinetic energy.

29. Answer: (B) A and C only

A magnetic sheet is attracted by the pole, so a force is needed to hold it in place. A conducting sheet moved in the non-uniform field has eddy currents induced that oppose the motion, so a force is needed to keep it moving at uniform velocity. A non-magnetic sheet at rest, or a non-conducting, non-polar sheet, experiences no magnetic force, so no extra force is needed in those cases.

30. Answer: (B) 50 × 10³ N

Thermal stress $= Y \alpha \Delta T = 0.5 \times 10^{11} \times 10^{-5} \times 100 = 5 \times 10^7$ N m^{-2}. Force = stress × area $= 5 \times 10^7 \times 10^{-3} = 5 \times 10^4$ N $= 50 \times 10^3$ N. The length of the bar does not enter the result.

31. Answer: (B) M/2

$M = m \times L$, where m is pole strength. After bending at the middle with a 60° angle, the two arms (each L/2) and the line joining the poles form an equilateral triangle, so the pole separation becomes L/2. New moment $= m \times L/2 = M/2$.

32. Answer: (B) A, C and E only

With the battery connected, V stays fixed. Reducing d increases $C = \varepsilon_0 A/d$, so $Q = CV$ increases and QV increases. Energy $\frac{1}{2}CV^2$ increases (not decreases), and $Q/V = C$ changes. So the correct statements are that the charge increases, the capacitance increases and the product QV increases.

33. Answer: (B) αt/β

Each term must have the dimension of force: $[\alpha][T^2] = [\beta][T] = [F]$. So $[\alpha] = [F]/T^2$ and $[\beta] = [F]/T$, giving $[\alpha t/\beta] = ([F]/T^2)(T)/([F]/T) = 1$, which is dimensionless. $\beta t/\alpha$ has dimensions T^2, not dimensionless.

Questions as set in the AIPMT/NEET papers conducted by CBSE and NTA. Answers checked and explanations written by the RankUp team. RankUp is not affiliated with CBSE or NTA.