

NEET 2017 — Physics Question Paper with Solutions

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

NEET 2017 · Q136

1. A spherical black body with a radius of 12 cm radiates 450 watt power at 500 K. If the radius were halved and the temperature doubled, the power radiated in watt would be:

- (A) 225
- (B) 450
- (C) 1000
- (D) 1800

NEET 2017 · Q138

2. The ratio of resolving powers of an optical microscope for two wavelengths $\lambda_1 = 4000 \text{ \AA}$ and $\lambda_2 = 6000 \text{ \AA}$ is:

- (A) 8 : 27
- (B) 9 : 4
- (C) 3 : 2
- (D) 16 : 81

NEET 2017 · Q141

3. A rope is wound around a hollow cylinder of mass 3 kg and radius 40 cm. What is the angular acceleration of the cylinder if the rope is pulled with a force of 30 N?

- (A) 25 m/s²
- (B) 0.25 rad/s²
- (C) 25 rad/s²
- (D) 5 m/s²

NEET 2017 · Q142

4. The resistance of a wire is 'R' ohm. If it is melted and stretched to 'n' times its original length, its new resistance will be:

- (A) nR
- (B) R/n
- (C) n²R
- (D) R/n²

NEET 2017 · Q143

5. The ratio of wavelengths of the last line of Balmer series and the last line of Lyman series is:

- (A) 2
- (B) 1
- (C) 4
- (D) 0.5

NEET 2017 · Q144

6. A beam of light from a source L is incident normally on a plane mirror fixed at a certain distance x from the source. The beam is reflected back as a spot on a scale placed just above the source L. When the mirror is rotated through a small angle θ , the spot of the light is found to move through a distance y on the scale. The angle θ is given by:

- (A) $y/2x$
- (B) y/x
- (C) $x/2y$
- (D) x/y

NEET 2017 · Q146

7. Two cars moving in opposite directions approach each other with speed of 22 m/s and 16.5 m/s respectively. The driver of the first car blows a horn having a frequency 400 Hz. The frequency heard by the driver of the second car is [velocity of sound 340 m/s]:

- (A) 350 Hz
- (B) 361 Hz
- (C) 411 Hz
- (D) 448 Hz

NEET 2017 · Q147

8. A particle executes linear simple harmonic motion with an amplitude of 3 cm. When the particle is at 2 cm from the mean position, the magnitude of its velocity is equal to that of its acceleration. Then its time period in seconds is:

- (A) $\sqrt{5}/\pi$
- (B) $\sqrt{5}/2\pi$
- (C) $4\pi/\sqrt{5}$
- (D) $2\pi/\sqrt{3}$

NEET 2017 · Q148

9. A carnot engine having an efficiency of 1/10 as heat engine, is used as a refrigerator. If the work done on the system is 10 J, the amount of energy absorbed from the reservoir at lower temperature is:

- (A) 1 J
- (B) 90 J
- (C) 99 J
- (D) 100 J

NEET 2017 · Q151

10. Preeti reached the metro station and found that the escalator was not working. She walked up the stationary escalator in time t_1 . On other days, if she remains stationary on the moving escalator, then the escalator takes her up in time t_2 . The time taken by her to walk up on the moving escalator will be:

- (A) $(t_1 + t_2)/2$
- (B) $t_1 t_2 / (t_2 - t_1)$
- (C) $t_1 t_2 / (t_2 + t_1)$
- (D) $t_1 - t_2$

NEET 2017 · Q152

11. A capacitor is charged by a battery. The battery is removed and another identical uncharged capacitor is connected in parallel. The total electrostatic energy of resulting system:

- (A) increases by a factor of 4
- (B) decreases by a factor of 2
- (C) remains the same
- (D) increases by a factor of 2

NEET 2017 · Q154

12. A potentiometer is an accurate and versatile device to make electrical measurements of E.M.F. because the method involves:

- (A) cells
- (B) potential gradients
- (C) a condition of no current flow through the galvanometer
- (D) a combination of cells, galvanometer and resistances

NEET 2017 · Q157

13. The acceleration due to gravity at a height 1 km above the earth is the same as at a depth d below the surface of earth. Then:

- (A) $d = 1/2$ km
- (B) $d = 1$ km
- (C) $d = 3/2$ km
- (D) $d = 2$ km

NEET 2017 · Q158

14. A gas mixture consists of 2 moles of O_2 and 4 moles of Ar at temperature T . Neglecting all vibrational modes, the total internal energy of the system is:

- (A) 4 RT
- (B) 15 RT
- (C) 9 RT
- (D) 11 RT

NEET 2017 · Q160

15. A thin prism having refracting angle 10° is made of glass of refractive index 1.42. This prism is combined with another thin prism of glass of refractive index 1.7. This combination produces dispersion without deviation. The refracting angle of second prism should be:

- (A) 4°
- (B) 6°
- (C) 8°
- (D) 10°

NEET 2017 · Q161

16. The bulk modulus of a spherical object is 'B'. If it is subjected to uniform pressure 'p', the fractional decrease in radius is:

- (A) p/B
- (B) $B/3p$
- (C) $3p/B$
- (D) $p/3B$

NEET 2017 · Q163

17. A physical quantity of the dimensions of length can be formed out of c , G and $e^2/4\pi\epsilon_0$ is [c is velocity of light, G is universal constant of gravitation, e is charge]:

- (A) $(1/c^2)[G e^2/4\pi\epsilon_0]^{1/2}$
- (B) $c^2[G e^2/4\pi\epsilon_0]^{1/2}$
- (C) $(1/c^2)[e^2/(G 4\pi\epsilon_0)]^{1/2}$
- (D) $(1/c) G e^2/4\pi\epsilon_0$

NEET 2017 · Q166

18. A spring of force constant k is cut into lengths of ratio 1 : 2 : 3. They are connected in series and the new force constant is k' . Then they are connected in parallel and force constant is k'' . Then $k' : k''$ is:

- (A) 1 : 6
- (B) 1 : 9
- (C) 1 : 11
- (D) 1 : 14

19. The x and y coordinates of the particle at any time are $x = 5t - 2t^2$ and $y = 10t$ respectively, where x and y are in meters and t in seconds. The acceleration of the particle at $t = 2$ s is:

- (A) 0
- (B) 5 m/s^2
- (C) -4 m/s^2
- (D) -8 m/s^2

20. In a common emitter transistor amplifier the audio signal voltage across the collector is 3 V. The resistance of collector is $3 \text{ k}\Omega$. If current gain is 100 and the base resistance is $2 \text{ k}\Omega$, the voltage and power gain of the amplifier is:

- (A) 200 and 1000
- (B) 15 and 200
- (C) 150 and 15000
- (D) 20 and 2000

Answer key and explanations

1. Answer: (D) 1800

By the Stefan-Boltzmann law $P = \sigma(4\pi r^2)T^4$, so $P \propto r^2T^4$. Halving r multiplies P by $1/4$ and doubling T multiplies it by 16, a net factor of 4: $450 \times 4 = 1800 \text{ W}$. Keeping only the radius change would give the trap value of about 112 W, and assuming the effects cancel gives 450 W.

2. Answer: (C) 3 : 2

Resolving power of a microscope is $2n \sin \theta/\lambda$, i.e. inversely proportional to wavelength. $RP_1 : RP_2 = \lambda_2 : \lambda_1 = 6000 : 4000 = 3 : 2$. Squaring or cubing the ratio (9 : 4, 8 : 27) has no basis.

3. Answer: (C) 25 rad/s^2

For a hollow cylinder about its axis $I = MR^2 = 3 \times (0.4)^2 = 0.48 \text{ kg m}^2$. Torque $\tau = FR = 30 \times 0.4 = 12 \text{ N m}$, so $\alpha = \tau/I = 12/0.48 = 25 \text{ rad/s}^2$. 25 m/s^2 has the right number but wrong units for an angular acceleration.

4. Answer: (C) n^2R

Melting and redrawing keeps the volume constant, so if length becomes nl the area becomes A/n . $R = \rho l/A$ then becomes $\rho(nl)/(A/n) = n^2R$. Taking only the length change gives nR .

5. Answer: (C) 4

The last (series limit) line has $n_1 \rightarrow \infty$. Balmer: $1/\lambda = R(1/4)$, so $\lambda = 4/R$; Lyman: $1/\lambda = R(1/1)$, so $\lambda = 1/R$. Their ratio is 4. Taking the ratio the other way round gives 0.25, not an option.

6. Answer: (A) $y/2x$

Rotating a mirror by θ turns the reflected ray by 2θ . For a small angle the spot moves $y = x \cdot 2\theta$ on the scale at distance x , so $\theta = y/2x$. Writing $\theta = y/x$ forgets the doubling of the reflected beam's rotation.

7. Answer: (D) 448 Hz

Source and observer approach each other, so $f' = f(v + v_o)/(v - v_s) = 400 \times (340 + 16.5)/(340 - 22) = 400 \times 356.5/318 \approx 448 \text{ Hz}$. The heard frequency must be higher than 400 Hz, which rules out 350 Hz and 361 Hz.

8. Answer: (C) $4\pi/\sqrt{5}$

Speed $v = \omega\sqrt{A^2 - x^2} = \omega\sqrt{9 - 4} = \sqrt{5} \omega$ and acceleration $a = \omega^2x = 2\omega^2$ (in cm units). Setting them equal gives $\omega = \sqrt{5}/2 \text{ rad/s}$, so $T = 2\pi/\omega = 4\pi/\sqrt{5} \text{ s}$. $\sqrt{5}/2\pi$ is the frequency, not the period.

9. Answer: (B) 90 J

For a Carnot cycle the coefficient of performance as a refrigerator is $\beta = (1 - \eta)/\eta = (9/10)/(1/10) = 9$. Heat drawn from the cold reservoir $Q_2 = \beta W = 9 \times 10 = 90 \text{ J}$. 100 J is the heat rejected to the hot reservoir ($Q_2 + W$).

10. Answer: (C) $t_1t_2/(t_2 + t_1)$

With escalator length L her speed is L/t_1 and the escalator's is L/t_2 . Moving together the speeds add, so $t = L/(L/t_1 + L/t_2) = t_1t_2/(t_1 + t_2)$, which is shorter than either time. The average $(t_1 + t_2)/2$ wrongly averages times instead of adding speeds.

11. Answer: (B) decreases by a factor of 2

With the battery removed, charge Q is conserved and is shared over capacitance $2C$. Energy goes from $Q^2/2C$ to $Q^2/(2 \times 2C)$, i.e. it halves; the lost half is dissipated during charge flow. Energy cannot stay the same even though charge is conserved.

12. Answer: (C) a condition of no current flow through the galvanometer

At the balance point no current flows through the galvanometer, so no current is drawn from the cell being measured and its terminal voltage equals its emf. This null method is what makes the potentiometer accurate; a voltmeter always draws some current.

13. Answer: (D) $d = 2$ km

For small heights $g_h = g(1 - 2h/R)$ and at depth $g_d = g(1 - d/R)$. Equating gives $d = 2h = 2$ km. Taking $d = h$ ignores the factor 2 in the height formula.

14. Answer: (D) 11 RT

Diatomic O_2 (no vibration) has 5 degrees of freedom: $U = 2 \times (5/2)RT = 5RT$. Monatomic Ar has 3: $U = 4 \times (3/2)RT = 6RT$. Total $U = 11RT$. Treating O_2 as having 3 degrees of freedom would give $9RT$.

15. Answer: (B) 6°

For zero net deviation $(\mu_1 - 1)A_1 = (\mu_2 - 1)A_2$, so $0.42 \times 10^\circ = 0.7 \times A_2$ and $A_2 = 6^\circ$. A smaller-angle prism of higher index cancels the deviation of the first.

16. Answer: (D) $p/3B$

Volumetric strain $\Delta V/V = p/B$, and for a sphere $V \propto r^3$ so $\Delta V/V = 3\Delta r/r$. Hence $\Delta r/r = p/3B$. p/B is the fractional change in volume, not radius.

17. Answer: (A) $(1/c^2)[G e^2/4\pi\epsilon_0]^{1/2}$

$e^2/4\pi\epsilon_0 = F r^2$ has dimensions $[M L^3 T^{-2}]$ and G has $[M^{-1} L^3 T^{-2}]$, so $G e^2/4\pi\epsilon_0$ has $[L^6 T^{-4}]$; its square root is $[L^3 T^{-2}]$. Dividing by $c^2 [L^2 T^{-2}]$ leaves $[L]$. Multiplying by c^2 instead gives $L^5 T^{-4}$.

18. Answer: (C) 1 : 11

Spring constant is inversely proportional to length, so the pieces ($l/6$, $2l/6$, $3l/6$) have constants $6k$, $3k$ and $2k$. In series they rebuild the original spring, $k' = k$; in parallel $k'' = 6k + 3k + 2k = 11k$. Hence $k' : k'' = 1 : 11$.

19. Answer: (C) -4 m/s^2

$a_x = d^2x/dt^2 = -4 \text{ m/s}^2$ (constant) and $a_y = d^2y/dt^2 = 0$ since y grows uniformly. The acceleration is therefore -4 m/s^2 along x at every instant, including $t = 2$ s. -8 m/s^2 comes from substituting $t = 2$ into $-4t$, which is not the acceleration.

20. Answer: (C) 150 and 15000

Voltage gain $A_V = \beta \times R_C/R_B = 100 \times 3/2 = 150$, and power gain $= \beta \times A_V = 100 \times 150 = 15000$. The 3 V signal value is not needed.

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.