

NEET 2017 (Gujarati paper) — Physics Question Paper with Solutions

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

NEET 2017 (Gujarati paper) · Q136

1. The energy liberated per nuclear fission is 200 MeV. If 10^{20} fissions occur per second the amount of power produced will be:

- (A) 32×10^8 W
- (B) 16×10^8 W
- (C) 5×10^{11} W
- (D) 2×10^{22} W

NEET 2017 (Gujarati paper) · Q137

2. If the angle of a prism is 60° and angle of minimum deviation is 40° , then the angle of refraction will be:

- (A) 30°
- (B) 20°
- (C) 3°
- (D) 4°

NEET 2017 (Gujarati paper) · Q138

3. In an experiment of photoelectric effect the stopping potential was measured to be V_1 and V_2 with incident light of wavelength λ and $\lambda/2$, respectively. The relation between V_1 and V_2 is:

- (A) $V_2 < V_1$
- (B) $V_1 < V_2 < 2V_1$
- (C) $V_2 = 2V_1$
- (D) $V_2 > 2V_1$

NEET 2017 (Gujarati paper) · Q140

4. A body initially at rest, breaks up into two pieces of masses $2M$ and $3M$ respectively, together having a total kinetic energy E . The piece of mass $2M$, after breaking up, has a kinetic energy:

- (A) $E/2$
- (B) $E/5$
- (C) $3E/5$
- (D) $2E/5$

NEET 2017 (Gujarati paper) · Q141

5. A satellite of mass m is in circular orbit of radius $3R_E$ about earth (mass of earth M_E , radius of earth R_E). How much additional energy is required to transfer the satellite to an orbit of radius $9R_E$?

- (A) $GM_E m/(18R_E)$
- (B) $3GM_E m/(2R_E)$
- (C) $GM_E m/(9R_E)$
- (D) $GM_E m/(3R_E)$

NEET 2017 (Gujarati paper) · Q142

6. A thin uniform rod of mass ' M ' and length ' L ' is rotating about a perpendicular axis passing through its centre with a constant angular velocity ' ω '. Two objects each of mass $M/3$ are attached gently to the two ends of the rod. The rod will now rotate with an angular velocity of:

- (A) $(1/7)\omega$
- (B) $(1/6)\omega$
- (C) $(1/2)\omega$
- (D) $(1/3)\omega$

NEET 2017 (Gujarati paper) · Q144

7. Imagine earth to be a solid sphere of mass M and radius R . If the value of acceleration due to gravity at a depth ' d ' below earth's surface is same as its value at a height ' h ' above its surface and equal to $g/4$ (where g is the value of acceleration due to gravity on the surface of earth), the ratio of h/d will be:

- (A) $4/3$
- (B) $3/2$
- (C) $2/3$
- (D) 1

NEET 2017 (Gujarati paper) · Q145

8. A parallel-plate capacitor is to be designed, using a dielectric of dielectric constant 5, so as to have a dielectric strength of 10^9 V m^{-1} . If the voltage rating of the capacitor is 12 kV, the minimum area of each plate required to have a capacitance of 80 pF is:

- (A) $21.7 \times 10^{-6} \text{ m}^2$
- (B) $25.0 \times 10^{-5} \text{ m}^2$
- (C) $12.5 \times 10^{-5} \text{ m}^2$
- (D) $10.5 \times 10^{-6} \text{ m}^2$

NEET 2017 (Gujarati paper) · Q146

9. Inside a parallel plate capacitor the electric field E varies with time as t^2 . The variation of induced magnetic field with time is given by:

- (A) no variation
- (B) t^3
- (C) t
- (D) t^2

NEET 2017 (Gujarati paper) · Q147

10. A ball of mass 1 kg is thrown vertically upwards and returns to the ground after 3 seconds. Another ball, thrown at 60° with vertical also stays in air for the same time before it touches the ground. The ratio of the two heights are:

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

NEET 2017 (Gujarati paper) · Q149

11. A light beam is incident on a denser medium whose refractive index is 1.414 at an angle of incidence 45° . Find the ratio of width of refracted beam in a medium to the width of the incident beam in air.

- (A) 1 : $\sqrt{2}$
- (B) $\sqrt{2}$: 1
- (C) $\sqrt{2}$: $\sqrt{3}$
- (D) $\sqrt{3}$: $\sqrt{2}$

NEET 2017 (Gujarati paper) · Q152

12. A cyclist on a level road takes a sharp circular turn of radius 3 m ($g = 10 \text{ m s}^{-2}$). If the coefficient of static friction between the cycle tyres and the road is 0.2, at which of the following speeds will the cyclist not skid while taking the turn?

- (A) 7.2 km h^{-1}
- (B) 9 km h^{-1}
- (C) 10.8 km h^{-1}
- (D) 14.4 km h^{-1}

NEET 2017 (Gujarati paper) · Q154

13. Two coherent sources of intensity ratio α interfere. The value of $(I_{\max} - I_{\min})/(I_{\max} + I_{\min})$ is:

- (A) $2\sqrt{\alpha}/(1 + \alpha)$
- (B) $(1 + \alpha)/(2\sqrt{\alpha})$
- (C) $(1 - \alpha)/(1 + \alpha)$
- (D) $2\sqrt{\alpha/(1 + \alpha)}$

NEET 2017 (Gujarati paper) · Q155

14. In a certain planetary system, it is observed that one of the celestial bodies having a surface temperature of 200 K, emits radiation of maximum intensity near the wavelength $12\ \mu\text{m}$. The surface temperature of a nearby star which emits light of maximum intensity at a wavelength $\lambda = 4800\ \text{\AA}$, is:

- (A) 5000 K
- (B) 2500 K
- (C) 10000 K
- (D) 7500 K

NEET 2017 (Gujarati paper) · Q157

15. A bulb connected in series with an air-cored solenoid is lit by an a.c. source. If a soft iron core is introduced in the solenoid:

- (A) The bulb will glow brighter.
- (B) There is no change in glow of bulb.
- (C) The bulb will become dimmer
- (D) The bulb stops glowing.

NEET 2017 (Gujarati paper) · Q159

16. Two open organ pipes of fundamental frequencies n_1 and n_2 are joined in series. The fundamental frequency of the new pipe so obtained will be:

- (A) $(n_1 + n_2)/2$
- (B) $\sqrt{(n_1^2 + n_2^2)}$
- (C) $n_1 n_2 / (n_1 + n_2)$
- (D) $(n_1 + n_2)$

NEET 2017 (Gujarati paper) · Q161

17. Two reasons for using soft iron as the material for electromagnets.

- (A) high permeability and low retentivity
- (B) low permeability and low retentivity
- (C) high permeability and high retentivity
- (D) low permeability and high retentivity

NEET 2017 (Gujarati paper) · Q163

18. One mole of a gas obeying the equation of state $P(V - b) = RT$ is made to expand from a state with coordinates (P_1, V_1) to a state with (P_2, V_2) along a process that is depicted by a straight line on a P-V diagram. Then, the work done is given by:

- (A) $(1/2)(P_1 + P_2)(V_2 - V_1)$
- (B) $(1/2)(P_2 - P_1)(V_2 - V_1)$
- (C) $(1/2)(P_1 + P_2)(V_2 - V_1 + 2b)$
- (D) $(1/2)(P_2 - P_1)(V_2 + V_1 + 2b)$

NEET 2017 (Gujarati paper) · Q164

19. A circular coil of radius 10 cm, 500 turns and resistance $2\ \Omega$ is placed with its plane perpendicular to the horizontal component of the earth's magnetic field. It is rotated about its vertical diameter through 180° in 0.25 s. The induced e.m.f. in the coil is: (Take $H_E = 3.0 \times 10^{-5}\text{ T}$)

- (A) $1.4 \times 10^{-2}\text{ V}$
- (B) $2.6 \times 10^{-2}\text{ V}$
- (C) $3.8 \times 10^{-3}\text{ V}$
- (D) $6.6 \times 10^{-4}\text{ V}$

NEET 2017 (Gujarati paper) · Q166

20. Due to Doppler effect, the shift in wavelength observed is $0.1\text{ \AA}$, for a star producing a wavelength $6000\text{ \AA}$. The velocity of recession of the star will be:

- (A) 2.5 km s^{-1}
- (B) 10 km s^{-1}
- (C) 5 km s^{-1}
- (D) 20 km s^{-1}

NEET 2017 (Gujarati paper) · Q169

21. The angle between $\vec{A} - \vec{B}$ and $\vec{A} \times \vec{B}$ is ($\vec{A} \neq \vec{B}$):

- (A) 90°
- (B) 120°
- (C) 45°
- (D) 60°

NEET 2017 (Gujarati paper) · Q172

22. If the longest wavelength in the ultraviolet region of hydrogen spectrum is λ_0 then the shortest wavelength in its infrared region is:

- (A) $(20/3)\lambda_0$
- (B) $(36/5)\lambda_0$
- (C) $(27/4)\lambda_0$
- (D) $(46/7)\lambda_0$

NEET 2017 (Gujarati paper) · Q173

23. A parallel beam of light of wavelength λ is incident normally on a single slit of width d . Diffraction bands are obtained on a screen placed at a distance D from the slit. The second dark band from the central bright band will be at a distance given by:

- (A) $\lambda d D$
- (B) $\lambda D / (2d)$
- (C) $2\lambda d / D$
- (D) $2\lambda D / d$

NEET 2017 (Gujarati paper) · Q176

24. The rotational kinetic energy of a solid sphere of mass 3 kg and radius 0.2 m rolling down an inclined plane of height 7 m is:

- (A) 60 J
- (B) 36 J
- (C) 70 J
- (D) 42 J

25. A student performs an experiment of measuring the thickness of a slab with a vernier calliper whose 50 divisions of the vernier scale are equal to 49 divisions of the main scale. He noted that zero of the vernier scale is between 7.00 cm and 7.05 cm mark of the main scale and 23rd division of the vernier scale exactly coincides with the main scale. The measured value of the thickness of the given slab using the calliper will be:

- (A) 7.23 cm
- (B) 7.023 cm
- (C) 7.073 cm
- (D) 7.73 cm

Answer key and explanations

1. Answer: (A) $32 \times 10^8 \text{ W}$

$200 \text{ MeV} = 200 \times 10^6 \times 1.6 \times 10^{-19} \text{ J} = 3.2 \times 10^{-11} \text{ J}$. Power = $10^{20} \text{ s}^{-1} \times 3.2 \times 10^{-11} \text{ J} = 3.2 \times 10^9 \text{ W} = 32 \times 10^8 \text{ W}$. Forgetting to convert MeV to joules gives a value like $2 \times 10^{22} \text{ W}$.

2. Answer: (A) 30°

At minimum deviation the ray passes symmetrically, so $r_1 = r_2$ and $r_1 + r_2 = A$. Hence $r = A/2 = 60^\circ/2 = 30^\circ$, whatever the deviation. 40° belongs to the angle of incidence calculation, $i = (A + \delta)/2 = 50^\circ$, not to r .

3. Answer: (D) $V_2 > 2V_1$

$eV_1 = hc/\lambda - \phi$ and $eV_2 = 2hc/\lambda - \phi = 2(eV_1 + \phi) - \phi = 2eV_1 + \phi$. Since the work function $\phi > 0$, $V_2 > 2V_1$. $V_2 = 2V_1$ would hold only if the work function were zero.

4. Answer: (C) $3E/5$

Momentum conservation gives equal and opposite momenta p , and $KE = p^2/2m$, so kinetic energy is inversely proportional to mass. $KE(2M) : KE(3M) = 3 : 2$, so the $2M$ piece gets $3E/5$. $2E/5$ is what you get by wrongly sharing the energy in proportion to mass.

5. Answer: (C) $GM_E m/(9R_E)$

Total energy in a circular orbit is $-GMm/2r$. $\Delta E = GM_E m/2 \times (1/3R_E - 1/9R_E) = GM_E m/2 \times 2/(9R_E) = GM_E m/(9R_E)$. Using only potential energies would double this to $2GM_E m/(9R_E)$.

6. Answer: (D) $(1/3)\omega$

$I_1 = ML^2/12$. Each added mass contributes $(M/3)(L/2)^2 = ML^2/12$, so $I_2 = ML^2/12 + 2 \times ML^2/12 = 3ML^2/12$. With no external torque, $I_1\omega = I_2\omega'$, so $\omega' = \omega/3$. Taking each mass at the full length L instead of $L/2$ leads to the wrong value $\omega/9$.

7. Answer: (A) $4/3$

Below the surface $g(1 - d/R) = g/4$ gives $d = 3R/4$. Above the surface $g/(1 + h/R)^2 = g/4$ gives $1 + h/R = 2$, so $h = R$. Hence $h/d = R/(3R/4) = 4/3$. Using the small-height formula $g(1 - 2h/R)$ would be wrong here because h is not small compared with R .

8. Answer: (A) $21.7 \times 10^{-6} \text{ m}^2$

The minimum plate separation is $d = V/E_{\text{max}} = 12 \times 10^3 / 10^9 = 1.2 \times 10^{-5} \text{ m}$. Then $A = Cd/(K\epsilon_0) = (80 \times 10^{-12} \times 1.2 \times 10^{-5}) / (5 \times 8.85 \times 10^{-12}) \approx 2.17 \times 10^{-5} \text{ m}^2 = 21.7 \times 10^{-6} \text{ m}^2$. Leaving out the dielectric constant would make the area five times larger.

9. Answer: (C) t

The induced magnetic field comes from the displacement current, $I_d = \epsilon_0 d\Phi_E/dt$, which is proportional to dE/dt . If $E \propto t^2$, then $dE/dt \propto t$, so $B \propto t$. $B \propto t^2$ would wrongly assume the field depends on E itself rather than on its rate of change.

10. Answer: (B) $1 : 1$

Time of flight $T = 2u_y/g$ depends only on the vertical component of velocity, and maximum height $H = u_y^2/2g = gT^2/8$. Equal flight times mean equal vertical components, so both balls rise to the same height, $1 : 1$ (each $H = 10 \times 9/8 \approx 11.25 \text{ m}$ with $g = 10 \text{ m s}^{-2}$). The 60° angle changes only the horizontal motion.

11. Answer: (D) $\sqrt{3} : \sqrt{2}$

$\sin r = \sin 45^\circ/1.414 = 0.5$, so $r = 30^\circ$. A beam crossing a boundary strip of length x has width $x \cos i$ in air and $x \cos r$ in the medium, so the ratio is $\cos 30^\circ/\cos 45^\circ = (\sqrt{3}/2)/(1/\sqrt{2}) = \sqrt{3} : \sqrt{2}$. The inverse ratio $\sqrt{2} : \sqrt{3}$ comes from swapping the two angles.

12. Answer: (A) 7.2 km h⁻¹

Friction must supply the centripetal force, so $v_{\text{max}} = \sqrt{\mu gr} = \sqrt{0.2 \times 10 \times 3} = \sqrt{6} \approx 2.45 \text{ m s}^{-1} \approx 8.8 \text{ km h}^{-1}$. Only 7.2 km h⁻¹ (2 m s⁻¹) is below this limit; 9 km h⁻¹ (2.5 m s⁻¹) is just above it, so the cyclist would skid.

13. Answer: (A) $2\sqrt{\alpha/(1+\alpha)}$

Let $l_1 = \alpha l_2$. $l_{\text{max}} = (\sqrt{l_1} + \sqrt{l_2})^2$ and $l_{\text{min}} = (\sqrt{l_1} - \sqrt{l_2})^2$, so $l_{\text{max}} - l_{\text{min}} = 4\sqrt{l_1 l_2}$ and $l_{\text{max}} + l_{\text{min}} = 2(l_1 + l_2)$. The ratio is $2\sqrt{l_1 l_2}/(l_1 + l_2) = 2\sqrt{\alpha/(1+\alpha)}$. The inverse form $(1+\alpha)/(2\sqrt{\alpha})$ is always at least 1, which a ratio of this kind cannot be.

14. Answer: (A) 5000 K

By Wien's law $\lambda_{\text{max}} T$ is constant: $12 \times 10^{-6} \text{ m} \times 200 \text{ K} = 2.4 \times 10^{-3} \text{ m K}$. For the star $T = 2.4 \times 10^{-3} / 4800 \times 10^{-10} = 5000 \text{ K}$. Getting 10000 K means 4800 Å was taken as $2.4 \times 10^{-7} \text{ m}$, a unit slip.

15. Answer: (C) The bulb will become dimmer

Soft iron raises the permeability and hence the inductance L , so the inductive reactance ωL and the circuit impedance increase. The rms current falls and the bulb glows dimmer. It does not go out completely, because the impedance is still finite.

16. Answer: (C) $n_1 n_2 / (n_1 + n_2)$

For an open pipe $n = v/2L$, so $L_1 = v/2n_1$ and $L_2 = v/2n_2$. The joined pipe has length $L_1 + L_2$, so $n = v/2(L_1 + L_2)$ and $1/n = 1/n_1 + 1/n_2$, giving $n = n_1 n_2 / (n_1 + n_2)$. A longer pipe must have a lower frequency, so $n_1 + n_2$ cannot be right.

17. Answer: (A) high permeability and low retentivity

An electromagnet should become strongly magnetised by a small current (high permeability) and lose its magnetism when the current is switched off (low retentivity and coercivity). High retentivity suits permanent magnets such as steel, not electromagnets.

18. Answer: (A) $(1/2)(P_1 + P_2)(V_2 - V_1)$

Work done is the area under the P-V path, whatever the equation of state. For a straight line from (V_1, P_1) to (V_2, P_2) the area is a trapezium: $W = \frac{1}{2}(P_1 + P_2)(V_2 - V_1)$. The constant b does not enter, because the work uses the actual volume change.

19. Answer: (C) $3.8 \times 10^{-3} \text{ V}$

A 180° turn reverses the flux, so $\Delta\Phi = 2NBA = 2 \times 500 \times 3.0 \times 10^{-5} \times \pi(0.1)^2 \approx 9.42 \times 10^{-4} \text{ Wb}$. Average emf = $\Delta\Phi/\Delta t = 9.42 \times 10^{-4} / 0.25 \approx 3.8 \times 10^{-3} \text{ V}$. The 2 Ω resistance affects the current, not the emf; dropping the factor 2 would give about $1.9 \times 10^{-3} \text{ V}$.

20. Answer: (C) 5 km s⁻¹

For $v \ll c$, $\Delta\lambda/\lambda = v/c$, so $v = c \times \Delta\lambda/\lambda = 3 \times 10^8 \times 0.1/6000 = 5 \times 10^3 \text{ m s}^{-1} = 5 \text{ km s}^{-1}$. Doubling the shift by mistake would give 10 km s⁻¹.

21. Answer: (A) 90°

$\vec{A} \times \vec{B}$ is perpendicular to the plane containing $\vec{A}$ and $\vec{B}$, and $\vec{A} - \vec{B}$ lies in that plane. So $(\vec{A} - \vec{B}) \cdot (\vec{A} \times \vec{B}) = 0$ and the angle is 90° for any non-parallel $\vec{A}$ and $\vec{B}$.

22. Answer: (C) $(27/4)\lambda_0$

The longest Lyman (UV) line is $n = 2 \rightarrow 1$: $1/\lambda_0 = R(1 - 1/4) = 3R/4$. The shortest infrared wavelength is the Paschen series limit, $\infty \rightarrow 3$: $1/\lambda = R/9$, so $\lambda = 9/R = 9 \times (3\lambda_0/4) = 27\lambda_0/4$. $36/5 \lambda_0$ is the longest Balmer line ($3 \rightarrow 2$), which is in the visible region.

23. Answer: (D) $2\lambda D/d$

Single-slit minima occur at $d \sin \theta = n\lambda$. For $n = 2$ and small angles, $y = D \tan \theta \approx 2\lambda D/d$. The form $2\lambda d/D$ has the slit width and screen distance swapped and does not even have units of length.

24. Answer: (A) 60 J

Total KE at the bottom = $mgh = 3 \times 10 \times 7 = 210 \text{ J}$ (taking $g = 10 \text{ m s}^{-2}$). For a solid sphere, $K_{\text{rot}}/K_{\text{total}} = (2/5)/(1 + 2/5) = 2/7$, so $K_{\text{rot}} = 210 \times 2/7 = 60 \text{ J}$. 70 J would be one third of the energy, the fraction for a different shape.

25. Answer: (B) 7.023 cm

One main scale division is 0.05 cm (the marks are at 7.00 and 7.05 cm), so the least count = 1 MSD – 1 VSD = $0.05/50 = 0.001 \text{ cm}$. Reading = $7.00 + 23 \times 0.001 = 7.023 \text{ cm}$. 7.23 cm would wrongly take the least count as 0.01 cm.

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