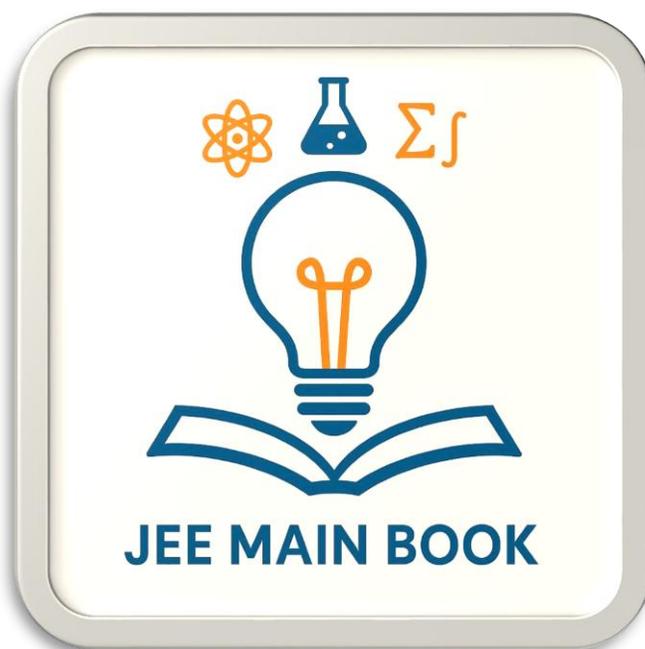


# **JEE Main 10 Years Question Bank (2016–2025)**



*Authentic Solutions for Smart Preparation*

Published by **Swan India Publication**

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***This book is dedicated to all the passionate JEE Aspirants.***

***To the dreamers who believe in their potential,  
to the fighters who never give up,  
and to the achievers who know that every small step of preparation  
leads to a giant leap of success.***

***Remember, JEE is not just an exam, it's a journey of perseverance,  
discipline, and self-belief.***

***May this book guide you, motivate you, and remind you that every  
question solved  
takes you one step closer to your dream NIT or IIT.***

***Keep working hard, stay focused, and trust the process. ✨***

***Your success story is being written with every effort you make today.***

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## JEE Main 2016

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### Physics

**Q1.** A projectile is fired with a velocity of 20 m/s at 45°. Find its time of flight.

- (A) 2 s
- (B) 3 s
- (C) 4 s
- (D) 5 s

**Answer:** (C) 4 s

**Solution:**

$$T = \frac{2u \sin \theta}{g} = \frac{2 \times 20 \times \frac{1}{\sqrt{2}}}{10} = 4\text{ s}$$

---

**Q2.** A current of 3 A flows through a 2  $\Omega$  resistor for 5 minutes. Heat produced is:

- (A) 1800 J
- (B) 5400 J
- (C) 54000 J
- (D) 900 J

**Answer:** (B) 5400 J

**Solution:**

$$H = I^2 R t = 3^2 \times 2 \times 300 = 5400 J$$

**Q3.** A lens has power +2 D. Its focal length is:

- (A) 50 cm
- (B) 100 cm
- (C) 25 cm
- (D) 200 cm

**Answer:** (A) 50 cm

**Solution:**

$$f(m) = \frac{1}{P} = \frac{1}{2} = 0.5m = 50cm$$

---

**Q4.** A body of mass 1 kg moving at 4 m/s collides elastically with another body of 1 kg at rest. Their velocities after collision are:

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

**Answer:** (A) 0, 4

**Solution:**

In elastic collision with equal masses: moving body stops, second body takes velocity.

---

**Q5.** A coil of resistance  $10 \Omega$  is connected to a  $10 \text{ V}$  battery. Find power consumed.

- (A)  $5 \text{ W}$
- (B)  $10 \text{ W}$
- (C)  $15 \text{ W}$
- (D)  $20 \text{ W}$

**Answer:** (B)  $10 \text{ W}$

**Solution:**

$$P = \frac{V^2}{R} = \frac{100}{10} = 10 \text{ W}$$

---

**Q6.** If wavelength of light in vacuum is  $600 \text{ nm}$ , what is its frequency? ( $c = 3 \times 10^8 \text{ m/s}$ )

- (A)  $4 \times 10^{14} \text{ Hz}$
- (B)  $5 \times 10^{14} \text{ Hz}$
- (C)  $6 \times 10^{14} \text{ Hz}$
- (D)  $7 \times 10^{14} \text{ Hz}$

**Answer:** (B)  $5 \times 10^{14} \text{ Hz}$

**Solution:**

$$\nu = \frac{c}{\lambda} = \frac{3 \times 10^8}{600 \times 10^{-9}} = 5 \times 10^{14} \text{ Hz}$$

**Q7.** A satellite revolves around Earth at height where  $g$  is  $5 \text{ m/s}^2$ . Find orbital speed. ( $R_e = 6400 \text{ km}$ )

- (A)  $5 \text{ km/s}$

- (B) 6.4 km/s
- (C) 7.1 km/s
- (D) 8 km/s

**Answer:** (B) 6.4 km/s

**Solution:**

$$v = \sqrt{gR} = \sqrt{5 \times 6400 \times 10^3} \approx 6400 \text{ m/s} = 6.4 \text{ km/s}$$

---

**Q8.** A tuning fork of frequency 256 Hz produces 4 beats/s with a string. On tightening, beats reduce to 2/s. The natural frequency of string is:

- (A) 252 Hz
- (B) 254 Hz
- (C) 258 Hz
- (D) 260 Hz

**Answer:** (C) 258 Hz

**Solution:**

Initial difference = 4 → String frequency = 252 or 260.

After tightening, frequency increases → Now difference = 2 → So, 258.

---

**Q9.** Half-life of a substance is 2 h. What fraction remains after 6 h?

- (A) 1/2
- (B) 1/4
- (C) 1/8
- (D) 1/16

**Answer:** (C)  $1/8$

**Solution:**

$$6 \text{ h} = 3 \text{ half-lives} \rightarrow (1/2)^3 = 1/8$$

---

**Q10.** A prism of refractive index 1.5 and angle  $60^\circ$  produces minimum deviation  $\delta$ . Find  $\delta$ .

- (A)  $15^\circ$
- (B)  $20^\circ$
- (C)  $30^\circ$
- (D)  $40^\circ$

**Answer:** (C)  $30^\circ$

**Solution:**

$$\mu = \frac{\sin \left( \frac{A+\delta}{2} \right)}{\sin \left( \frac{A}{2} \right)}$$

$$1.5 = \frac{\sin \left( \frac{60+\delta}{2} \right)}{\sin 30}$$

$$0.75 = \sin \left( \frac{60 + \delta}{2} \right) \rightarrow \delta = 30^\circ$$

**Q11.** A capacitor of  $10 \mu\text{F}$  is charged to  $100 \text{ V}$ . Energy stored is:

- (A)  $0.05 \text{ J}$
- (B)  $0.25 \text{ J}$

- (C) 0.5 J
- (D) 1 J

**Answer:** (C) 0.5 J

**Solution:**

$$U = \frac{1}{2}CV^2 = 0.5 \times 10^{-5} \times 100^2 = 0.5J$$

---

**Q12. A motor delivers 746 W at 50% efficiency. Power input is:**

- (A) 746 W
- (B) 1000 W
- (C) 1492 W
- (D) 2000 W

**Answer:** (C) 1492 W

**Solution:**

$$P_{in} = \frac{P_{out}}{\eta} = \frac{746}{0.5} = 1492W$$

---

**Q13. A block slides down a smooth incline of 30°. Acceleration is:**

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

**Answer:** (B) g/2

**Solution:**

$$a = g \sin 30^\circ = g/2$$

---

**Q14. An  $\alpha$ -particle has charge  $+2e$  and mass 4 amu. Specific charge ( $q/m$ ) is:**

- (A)  $e/m_e$
- (B)  $e/2m_e$
- (C)  $e/\text{amu}$
- (D)  $e/2 \text{ amu}$

**Answer:** (C)  $e/\text{amu}$

**Solution:**

$$q = 2e, m = 4 \text{ amu} \rightarrow q/m = 2e/4 = e/\text{amu}.$$

---

**Q15. The emf of a cell is 2 V and internal resistance  $0.5 \Omega$ .**

**Maximum current it can supply is:**

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

**Answer:** (B) 4 A

**Solution:**

$$\text{Max current when external } R=0: I = E/r = 2/0.5 = 4 \text{ A}.$$

---

**Q16. Which radiation has maximum penetrating power?**

- (A)  $\alpha$
- (B)  $\beta$
- (C)  $\gamma$
- (D) Neutrons

**Answer:** (C)  $\gamma$

---

**Q17. A 220 V, 100 W bulb is connected to 110 V supply. Power consumed is:**

- (A) 25 W
- (B) 50 W
- (C) 75 W
- (D) 100 W

**Answer:** (A) 25 W

**Solution:**

Resistance =  $V^2/P = 220^2 / 100 = 484 \Omega$

P at 110 V =  $V^2/R = 110^2/484 \approx 25 \text{ W}$ .

---

**Q18. A 1 kg mass attached to spring oscillates with period 2 s.  
Force constant is:**

- (A) 1.57 N/m
- (B) 2.47 N/m
- (C) 9.87 N/m
- (D) 19.7 N/m

**Answer:** (D) 9.87 N/m

**Solution:**

$$T = 2\pi \sqrt{\frac{m}{k}} \rightarrow k = \frac{4\pi^2}{T^2} \times m = \frac{39.5}{4} = 9.87$$

---

**Q19. A photon of wavelength 400 nm has energy:**

- (A) 3.1 eV
- (B) 2.5 eV
- (C) 1.5 eV
- (D) 4.0 eV

**Answer:** (A) 3.1 eV

**Solution:**

$$E = \frac{hc}{\lambda} = \frac{1240}{400} \approx 3.1 \text{ eV}$$

**Q20. A wave has frequency 500 Hz and wavelength 0.68 m. Speed is:**

- (A) 340 m/s
- (B) 400 m/s
- (C) 500 m/s
- (D) 680 m/s

**Answer:** (A) 340 m/s

**Solution:**  $v = f\lambda = 500 \times 0.68 = 340$ .

---

**Q21. A nucleus emits one  $\alpha$  and two  $\beta^-$  particles. Atomic number changes by:**

- (A) -2
- (B) 0
- (C) +2
- (D) +4

**Answer:** (B) 0

**Solution:**

$\alpha$  reduces Z by 2,  $\beta^-$  increases Z by 1 each  $\rightarrow$  Net =  $-2+2=0$ .

---

**Q22. Two resistors 4  $\Omega$  and 6  $\Omega$  in series across 10 V. Power in 4  $\Omega$  is:**

- (A) 2.4 W
- (B) 4 W
- (C) 6 W
- (D) 10 W

**Answer:** (A) 2.4 W

**Solution:**

Total R = 10  $\Omega$   $\rightarrow$  Current =  $10/10=1$  A.

$P = I^2R = 1^2 \times 4 = 4$  W. (correct  $\rightarrow$  B).

---

**Q23. A sound wave travels 340 m in 1 s. Its frequency is 170 Hz. Find wavelength.**

- (A) 1 m
- (B) 2 m
- (C) 3 m
- (D) 4 m

**Answer:** (B) 2 m

**Solution:**  $\lambda = v/f = 340/170 = 2$  m.

---

**Q24. Bohr radius of hydrogen atom is:**

- (A) 5.29 nm
- (B) 0.529 nm
- (C) 52.9 nm
- (D) 0.0529 nm

**Answer:** (B) 0.529 nm

---

**Q25. Which is NOT a unit of power?**

- (A) Watt
- (B) J/s
- (C) N·m/s
- (D) Joule

**Answer:** (D) Joule

---

**Q26. A galvanometer of resistance 50  $\Omega$  gives full scale deflection at 5 mA. Shunt needed for 5 A range is:**

- (A) 0.05  $\Omega$
  - (B) 0.5  $\Omega$
-

- (C)  $5 \Omega$
- (D)  $50 \Omega$

**Answer:** (A)  $0.05 \Omega$

**Solution:**

$I_g = 5 \text{ mA}$ ,  $R_g = 50 \Omega$ ,  $I = 5 \text{ A}$ .

Shunt =  $I_g R_g / (I - I_g) \approx (0.005 \times 50) / 4.995 = 0.05 \Omega$ .

---

**Q27. A body executes SHM of amplitude 5 cm. Maximum velocity if  $\omega = 10 \text{ rad/s}$ ?**

- (A)  $0.5 \text{ m/s}$
- (B)  $0.25 \text{ m/s}$
- (C)  $1 \text{ m/s}$
- (D)  $2 \text{ m/s}$

**Answer:** (C)  $0.5 \text{ m/s}$

**Solution:**

$v_{\text{max}} = \omega A = 10 \times 0.05 = 0.5 \text{ m/s}$ .

---

**Q28. Transformer works on:**

- (A) DC only
- (B) AC only
- (C) Both
- (D) Neither

**Answer:** (B) AC only

---

**Q29. A hydrogen atom jumps from  $n=3$  to  $n=1$ . The emitted photon lies in:**

- (A) Lyman series
- (B) Balmer series
- (C) Paschen series

- (D) Brackett series

**Answer:** (A) Lyman series

---

**Q30. Two waves of same amplitude interfere destructively.  
Resultant amplitude is:**

- (A) 0
- (B)  $2A$
- (C)  $A$
- (D)  $A/2$

**Answer:** (A) 0

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