Smartborn

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Test: 1st test

Duration: 60 minutes | Total Marks: 100

Q1. A uniform rod of length L is placed symmetrically on two smooth inclined planes of inclination θ and 2θ meeting at the bottom. Determine the minimum coefficient of friction μ between the rod and each plane such that the rod remains in equilibrium without slipping or sliding down.

A) ** \(\mu = \frac{1 - \sin \theta}{2 \cos \theta + \sin \theta + \sqrt{1 + \tan^2 \theta}}\)
B) ** \(\mu = \frac{\tan \theta + \tan 2\theta}{2(1 + \cos \theta \cos 2\theta)}\)
C) ** \(\mu = \frac{1}{2} \left(\tan \theta + \tan 2\theta \right)\)
D) ** \(\mu = \frac{\sin(\theta + 2\theta)}{2(\cos \theta + \cos 2\theta)}\)

Q2. A rigid body is rotating about a fixed axis with angular velocity ω while a tangential force F causes both translation of the center of mass and rotation about it. Derive the instantaneous axis of rotation and show that its distance from the center of mass is \(\frac{v_{cm}}{\omega} \), where \(v_{cm} \) is the center of mass speed.

A) \(\frac{F}{m\omega}\), where \(m\) is mass
B) \(\frac{v_{cm}}{\omega}\)
C) \(\frac{v_{cm}}{\alpha}\), where \(\alpha\) is angular acceleration
D) \(\frac{I\omega}{F}\), where \(I\) is moment of inertia about CM

Q3. A smooth hollow spherical shell of inner radius R and outer radius 2R carries a uniform volume charge density ρ; a small circular hole of radius a (a << R) is cut in the shell wall (through both surfaces). Using the principle of superposition, determine the approximate electric field at the center of the hole (neglect edge effects) and explain qualitatively its direction.

A) \(\frac{\rho R}{2 \epsilon_0}\), directed toward the center of the shell
B) \(\frac{\rho R}{\epsilon_0}\), directed toward the center of the shell
C) \(\frac{\rho R}{2 \epsilon_0}\), directed away from the center of the shell

D) 0

Q4. dwedewdw

Q5. ddqwdw

Q6. rfefedfwe

Q7. [JEE - EASY] Chemistry - Chemical Bonding: Question 1

A) Option A - Sample answer for question 1
B) Option B - Sample answer for question 1
C) Option C - Sample answer for question 1
D) Option D - Sample answer for question 1

Q8. [JEE - EASY] Chemistry - Chemical Bonding: Question 2

A) Option A - Sample answer for question 2
B) Option B - Sample answer for question 2
C) Option C - Sample answer for question 2
D) Option D - Sample answer for question 2

Q9. [JEE - EASY] Chemistry - Chemical Bonding: Question 3

A) Option A - Sample answer for question 3
B) Option B - Sample answer for question 3
C) Option C - Sample answer for question 3
D) Option D - Sample answer for question 3
A) Option A - Sample answer for question 3
B) Option B - Sample answer for question 3
C) Option C - Sample answer for question 3
D) Option D - Sample answer for question 3

Q10. [JEE - EASY] Chemistry - Chemical Bonding: Question 4

A) Option A - Sample answer for question 4
B) Option B - Sample answer for question 4
C) Option C - Sample answer for question 4
D) Option D - Sample answer for question 4

A) Option A - Sample answer for question 4
B) Option B - Sample answer for question 4
C) Option C - Sample answer for question 4
D) Option D - Sample answer for question 4
A) Option A - Sample answer for question 4
B) Option B - Sample answer for question 4
C) Option C - Sample answer for question 4
D) Option D - Sample answer for question 4

Q11. [JEE - EASY] Chemistry - Chemical Bonding: Question 5

A) Option A - Sample answer for question 5
B) Option B - Sample answer for question 5
C) Option C - Sample answer for question 5
D) Option D - Sample answer for question 5
A) Option A - Sample answer for question 5
B) Option B - Sample answer for question 5
C) Option C - Sample answer for question 5
D) Option D - Sample answer for question 5
A) Option A - Sample answer for question 5
B) Option B - Sample answer for question 5
C) Option C - Sample answer for question 5
D) Option D - Sample answer for question 5

Q12. [NEET - MEDIUM] Chemistry - Chemical Bonding: Question 1

A) Option A - Sample answer for question 1
B) Option B - Sample answer for question 1
C) Option C - Sample answer for question 1
D) Option D - Sample answer for question 1
A) Option A - Sample answer for question 1
B) Option B - Sample answer for question 1
C) Option C - Sample answer for question 1
D) Option D - Sample answer for question 1
A) Option A - Sample answer for question 1
B) Option B - Sample answer for question 1
C) Option C - Sample answer for question 1
D) Option D - Sample answer for question 1

Q13. [NEET - MEDIUM] Chemistry - Chemical Bonding: Question 2

A) Option A - Sample answer for question 2
B) Option B - Sample answer for question 2

C) Option C - Sample answer for question 2
D) Option D - Sample answer for question 2
A) Option A - Sample answer for question 2
B) Option B - Sample answer for question 2
C) Option C - Sample answer for question 2
D) Option D - Sample answer for question 2

Q14. [NEET - MEDIUM] Chemistry - Chemical Bonding: Question 3

A) Option A - Sample answer for question 3
B) Option B - Sample answer for question 3
C) Option C - Sample answer for question 3
D) Option D - Sample answer for question 3
A) Option A - Sample answer for question 3
B) Option B - Sample answer for question 3
C) Option C - Sample answer for question 3
D) Option D - Sample answer for question 3
A) Option A - Sample answer for question 3
B) Option B - Sample answer for question 3
C) Option C - Sample answer for question 3
D) Option D - Sample answer for question 3

Q15. [NEET - MEDIUM] Chemistry - Chemical Bonding: Question 4

A) Option A - Sample answer for question 4
B) Option B - Sample answer for question 4
C) Option C - Sample answer for question 4
D) Option D - Sample answer for question 4
A) Option A - Sample answer for question 4
B) Option B - Sample answer for question 4
C) Option C - Sample answer for question 4
D) Option D - Sample answer for question 4
A) Option A - Sample answer for question 4
B) Option B - Sample answer for question 4
C) Option C - Sample answer for question 4
D) Option D - Sample answer for question 4
A) Option A - Sample answer for question 4
B) Option B - Sample answer for question 4
C) Option C - Sample answer for question 4
D) Option D - Sample answer for question 4

Q16. [NEET - MEDIUM] Chemistry - Chemical Bonding: Question 5

A) Option A - Sample answer for question 5
B) Option B - Sample answer for question 5
C) Option C - Sample answer for question 5
D) Option D - Sample answer for question 5
A) Option A - Sample answer for question 5
B) Option B - Sample answer for question 5
C) Option C - Sample answer for question 5
D) Option D - Sample answer for question 5
A) Option A - Sample answer for question 5
B) Option B - Sample answer for question 5
C) Option C - Sample answer for question 5
D) Option D - Sample answer for question 5

Q17. [NEET - MEDIUM] Chemistry - Chemical Bonding: Question 1

A) Option A - Sample answer for question 1
B) Option B - Sample answer for question 1
C) Option C - Sample answer for question 1
D) Option D - Sample answer for question 1
A) Option A - Sample answer for question 1
B) Option B - Sample answer for question 1
C) Option C - Sample answer for question 1
D) Option D - Sample answer for question 1
A) Option A - Sample answer for question 1
B) Option B - Sample answer for question 1
C) Option C - Sample answer for question 1
D) Option D - Sample answer for question 1
A) Option A - Sample answer for question 1
B) Option B - Sample answer for question 1
C) Option C - Sample answer for question 1
D) Option D - Sample answer for question 1

Q18. [NEET - MEDIUM] Chemistry - Chemical Bonding: Question 2

A) Option A - Sample answer for question 2
B) Option B - Sample answer for question 2
C) Option C - Sample answer for question 2
D) Option D - Sample answer for question 2

Q19. A block of mass 5 kg is placed on a rough horizontal surface ($\mu = 0.4$) and pulled by a horizontal force F that increases gradually from zero. If $g = 10\ m/s^2$, what is the maximum value of F for which the block remains stationary, and explain why it does not move even when F equals this value?

A) 20 N**
B) 10 N**
C) 50 N**
D) 2 N**

Q20. A block of mass 5 kg is placed on a rough horizontal surface (μ = 0.4) and pulled by a horizontal force F that varies as F = 10t N (t in seconds). Determine the time at which the block starts moving, given g = 10 m/s².

A) **2 s**
B) 1 s
C) 0.4 s
D) 5 s

Q21. A block of mass 5 kg is placed on a rough horizontal surface (μ = 0.4) and pulled by a horizontal force F that varies with time as F = 10t N (t in seconds). Determine the time at which the block starts moving, considering the limiting friction.

A) **2 s**
B) 0.4 s
C) 1 s
D) 5 s

Q22. A particle is projected with velocity \(u \) at an angle \(\theta \) to the horizontal from the top of a tower of height \(h \). If the horizontal range on the ground is \(R \) and the particle lands at the same level as the projection point relative to the ground, the speed of projection \(u \) satisfies which relation?

A) \(u=\sqrt{\dfrac{gR^{2}}{2h\cos^{2}\theta}}\)
B) \(u=\dfrac{R}{\cos\theta}\sqrt{\dfrac{g}{2h}}\)
C) \(u=\sqrt{\dfrac{gR^{2}}{2h\sin^{2}\theta}}\)
D) \(u=\dfrac{R}{\sin\theta}\sqrt{\dfrac{g}{2h}}\)

Q23. A projectile is launched with initial velocity \(u \) at angle \(\theta \) to the horizontal. If the horizontal range is maximum for a given \(u \), determine the ratio of maximum height reached to the horizontal range.

A) 1/2
B) 1/3
C) 1/4

D) 1/6
A) 1/2
B) 1/3
C) 1/4
D) 1/6
A) 1/2
B) 1/3
C) 1/4
D) 1/6

Q24. A particle is projected with speed \(u\) at an angle \(\theta\) to the horizontal from the top of a tower of height \(h\). If the horizontal range on the ground is equal to the maximum height attained above the projection point, the correct relation between \(u\), \(\theta\), \(g\), and \(h\) is:

A) \(\frac{u^{2} \sin ^{2} \theta}{g}=2 h\)**
B) \(\frac{u^{2} \sin ^{2} \theta}{2 g}=h\)**
C) \(u^{2} \sin ^{2} \theta=2 g h\)**
D) \(\frac{u^{2}}{g}(1-\cos \theta)=2 h\)**
A) \(\frac{u^{2} \sin ^{2} \theta}{g}=2 h\)**
B) \(\frac{u^{2} \sin ^{2} \theta}{2 g}=h\)**
C) \(u^{2} \sin ^{2} \theta=2 g h\)**
D) \(\frac{u^{2}}{g}(1-\cos \theta)=2 h\)**

Q25. A particle is projected with velocity \(u \) at an angle \(\theta \) to the horizontal from the top of a tower of height \(h \). If the horizontal range on the ground is \(R \) and the time of flight is \(T \), which of the following relations is correct?

A) \(\frac{1}{2} g T^2 = h + R \tan \theta \)
B) \(R = \frac{u \cos \theta}{g} (u \sin \theta + \sqrt{u^2 \sin^2 \theta + 2 g h}) \)
C) \(T = \frac{2 u \sin \theta}{g} \)
D) \(R = \frac{u^2 \sin 2\theta}{g} \)

Q26. A projectile is launched with initial velocity \(u \) at angle \(\theta \) to the horizontal. If the maximum height attained by it is \(H \) and the horizontal range is \(R \), what is the ratio \(\frac{H}{R} \)?

A) \(\frac{1}{4} \tan \theta \)
B) \(\frac{\tan \theta}{2} \)
C) \(\tan \theta \)
D) \(\frac{1}{2} \tan \theta \)
A) \(\frac{1}{4} \tan \theta \)

B) $\frac{\tan \theta}{2}$
C) $\tan \theta$
D) $\frac{1}{2} \tan \theta$

Q27. Which of the following molecules has a bond angle closest to 120° due to sp2 hybridization of the central atom?

A) BF
B) CH
C) NH
D) HO
A) BF
B) CH
C) NH
D) HO

Q28. Which of the following explains why BeCl2 is linear in the gas phase but forms an electron-deficient polymeric structure in the solid state?

A) In the gas phase BeCl2 is linear because beryllium is sphybridized with two electron domains and no need for additional bonds, while in the solid state BeCl2 polymerizes because Be is electrondeficient and forms additional coordinate (bridging) bonds to chlorine to attain an octet, giving a chain (polymeric) structure.

B) BeCl2 is linear in the gas phase because strong ionic Be2+–Cl− electrostatic attraction fixes two terminal Cl− around Be2+, but in the solid state increased lattice energy favors covalent bridging between Be and Cl and formation of polymeric chains.

C) The gasphase linear form arises from repulsion between lone pairs on chlorine that forces a 180° Cl–Be–Cl angle, whereas in the solid state those lone pairs are delocalized into Be orbitals producing multicenter bonding and a polymeric structure.

D) BeCl2 is linear in vapor because high thermal energy populates an excited sphybridized state of Be giving a monomeric linear molecule, while cooling to the solid permits rehybridization (to higher coordination around Be) and formation of electrondeficient bridged polymers.

Q29. [NEET - MEDIUM] Chemistry - Chemical Bonding: Question 3

A) Option A - Sample answer for question 3
B) Option B - Sample answer for question 3
C) Option C - Sample answer for question 3
D) Option D - Sample answer for question 3

Q30. [NEET - MEDIUM] Chemistry - Chemical Bonding: Question 5

A) Option A - Sample answer for question 5
B) Option B - Sample answer for question 5
C) Option C - Sample answer for question 5
D) Option D - Sample answer for question 5

Q31. [NEET - MEDIUM] Biology - Cell Biology: Question 1 (API call failed)

A) Option A - Sample answer for question 1
B) Option B - Sample answer for question 1
C) Option C - Sample answer for question 1
D) Option D - Sample answer for question 1

Q32. A particle is projected with speed u at an angle θ to the horizontal from the top of a tower of height h. If the horizontal range equals the maximum height attained by the projectile (ignoring air resistance), the relation between u, θ, and h is:

A) **$u^2 = gh\,(1 + 2\sin^2\theta)$**
B) $u^2 = 2gh / \sin^2\theta$
C) $\tan\theta = 2h / u^2$
D) $u^2 \sin^2\theta = 2gh$

Q33. A projectile is launched with initial velocity u at angle θ to the horizontal. If the maximum height reached is H and the time to reach it is t, which of the following relations is correct?

A) $H = \frac{1}{2} g t^{2}$
B) $H = g t^{2}$
C) $t = \frac{2H}{g}$
D) $H = \frac{u^{2} \sin^{2} \theta}{g}$

Answer Key

Q1. Answer: N/A
Q2. Answer: B
Q3. Answer: A
Q4. Answer: N/A
Q5. Answer: N/A
Q6. Answer: N/A
Q7. Answer: A
Q8. Answer: A
Q9. Answer: A
Q10. Answer: A
Q11. Answer: A
Q12. Answer: A
Q13. Answer: A
Q14. Answer: A
Q15. Answer: A
Q16. Answer: A
Q17. Answer: A
Q18. Answer: A
Q19. Answer: A
Q20. Answer: A
Q21. Answer: A
Q22. Answer: B
Q23. Answer: C
Q24. Answer: A
Q25. Answer: A
Q26. Answer: A
Q27. Answer: A
Q28. Answer: A
Q29. Answer: A
Q30. Answer: A
Q31. Answer: A
Q32. Answer: A
Q33. Answer: A