0 ratings0% found this document useful (0 votes)122 views2 pagesThis document is a physics worksheet containing 27 multiple choice questions related to the topic of rotational motion. The questions cover concepts such as center of mass, moment of inertia…AI-enhanced title and descriptionSaveSave CH-7 ROTATIONAL MOTION WORKSHEET-1 For Later0%0% found this document useful, undefined0 ratings0% found this document useful (0 votes)122 views2 pagesThis document is a physics worksheet containing 27 multiple choice questions related to the topic of rotational motion. The questions cover concepts such as center of mass, moment of inertia, angular momentum, torque, rotational kinetic energy, and radii of gyration. Example questions include why it is more difficult to revolve a stone tied to a larger string compared to a smaller string, and calculating the moment of inertia and angular momentum of a rotating ring given its diameter, mass, and rotation rate.0 ratings0% found this document useful (0 votes)122 views2 pagesThis document is a physics worksheet containing 27 multiple choice questions related to the topic of rotational motion. The questions cover concepts such as center of mass, moment of inertia…AI-enhanced title and description Dark mode This online quiz is intended to give you extra practice in performing a variety of rotational dynamics calculations involving torque, rotational inertia and angular momentum around a fixed axis. This quiz aligns with AP® Physics 1: Algebra-Based Learning Objectives 5.3 Torque, 5.4 Rotational Inertia, and 5.6 Newton's Second Law in Rotational Form. Select your preferences below and click 'Start' to give it a try! Learning Goal: Concept 1: Translational Equilibrium Concept 2: Torque at 90 Degrees Concept 3: Torque NOT at 90 Degrees   Concept 4: Rotational Kinematics   Concept 5: Torque generated from Rotating Objects   Concept 6: Angular Momentum/Impulse and Angular Kinetic Energy Notes: Unit 6a EquilibriumNotes: Unit 6b Rotational Kinematics/DynamicsStudent Log - Unit 6 - EquilibriumEquilibrium Review PackageChallenging Equilibrium Questions (Great for Review!)Rotation Review PackageNote Keys:Notes-1: Translational EquilibriumNotes-2: Torque at 90 DegreesNotes-3: Torque not at 90 DegreesNotes-4: Rotational KinematicsNotes-5: Torque, Angular Momentum/Impulse and Angular Kinetic EnergyDay 1: Transitional EquilibriumHomework: Finish Worksheet - Transitional Equilibrium Next Class: TorqueWorksheet - Transitional Equilibrium Day 2: Quiz - Translational Equilibrium + Torque at 90 DegreesHomework: Finish Worksheet - Torque at 90 Degrees + Prep for LabNext Class: Lab: Balance Beam Day 3: Quiz 2 + Lab: Balance BeamsHomework: Finish Worksheet - Torque at 90 Degrees if not already complete + Lab: Balance Beam (due next class)Next Class: Torque NOT at 90 DegreesQuiz: 2a, 2b, 2cGoogle Classroom Link Day 4: Quiz 3 + Torque NOT at 90 Degrees + Bridge Builder Day IHomework: Finish Worksheet - Torque NOT at 90 Degrees + Challenging Equilibrium Problems (see below)Next Class: Bridge Builder Day II Day 5: Quiz 4 + Bridge Builder Day IIHomework: Complete Torque NOT at 90 Degrees + Project Bridge BuilderNext Class: Bridge BuilderQuiz: 4a, 4b, 4cGoogle Classroom Link Day 6: Project - Bridge Builder Day IIIHomework: Complete Bridge BuilderNext Class: Rotational KinematicsQuiz: 5a, 5b, 5c Reading - Angular Velocity Day 7: Rotational KinematicsHomework: Worksheet - Rotational KinematicsNext Class: Quiz 6 + Rotational Inertia, Angular Momentum/Kinetic EnergyWorksheet - Rotational Kinematics Day 8: Quiz 6 - Rotational Kinematics + Rotational Inertia, Angular Momentum/Kinetic EnergyHomework: Worksheet - Rotational Inertia, Angular Momentum/Kinetic EnergyNext Class: Quiz 7 + Bridge Builder Test Day! + Review/Catchup Day Day 9: Quiz 7 - Rotational Inertia, Angular Momentum/Kinetic Energy + Bridge Builder Test Day!Homework: Worksheet - Rotational Inertia, Angular Momentum/Kinetic EnergyNext Class: Equilibrium and Rotation Motion Unit Quiz Day 10: Socrative Equilibrium Concept Check + Equilibrium and Rotational Motion Unit Quiz Homework: Review for Equilibrium Unit TestsNext Class: Equilibrium and Rotational Motion Unit TestDay 11: Equilibrium and Rotational Motion Unit TestHomework: Read Handout - Waves and SoundNext Class: Waves Basics Angular Mechanics | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | Go up - by Elias Dubelsten, (2001) and Chris Murray (2002) 1. What is the moment of inertia of a 5.00 Kg 34.0 cm radius hoop about its normal axis? To solve this problem, you merely have to look at the equation of the inertia of a hoop. The equation for the moment of Inertia for a hoop is: $I= mr^2$. By plugging in the numbers, you end up with: $I= (5kg) * (.34m)^2$ $I= .578 Kgm^2$ (Table of contents) 2. What is the moment of inertia of a 8.0 Kg 10. cm radius sphere about its center? Just the same as problem #1, you can solve this problem by looking up the equation for the moment of inertia for a sphere. This formula is: $I=2/5mr^2$ $I= (2/5) * (8kg) * (.1)^2$ $I= .032Kgm^2$ (Table of contents) 3. What is the torque when you exert a force of 52 N on a 56 cm breaker bar? In this problem, you are given the force (52N) and the radius (.56 meters). By using the equation: t = Fr, you can arrive at your answer. Just plug in the numbers: t = (52N) * (.56m) And the final answer is: t = 29.12Nm (Table of contents) 4. What force should you exert on a 14 cm long wrench to get a torque of 42 Nm? This problem is similar to #4 in that you must use the equation t = Fr, however, you are given different values. In this problem, you are given the final torque value (42 Nm), and the radius (.14 meters). Therefore, you must reshape the formula to solve for the force: t / r = F Then, by plugging in the numbers: (42Nm)/(.14m) = Force You arrive at your answer of: 300N (Table of contents) 5. . If you exert a torque of 68 Nm on a flywheel with an I of 12 Kgm2, what is its angular acceleration? To complete this problem, you must find an equation that has torque, angular acceleration, and moment of inertia. This equation is: t = I a. You are given the torque, and the moment of inertia, so you must reshape the formula to solve for angular acceleration, thus being left with the equation: t / I = a. By plugging in the given values: $(68Nm)/(12Kgm^2)$ = a And you arrive at your final answer (remember that angular acceleration is in rad/s^2!!!!!): $a = 5.66 rad/s^2$ (Table of contents) 6. A drill exerts a torque of 80. Nm on a 1.2 Kg .12 m radius grinding disk that is a solid cylinder. What is the angular acceleration of the disk? To solve this problem, you must recognize that you need to find the moment of inertia first. You are given the information that this is a solid cylinder ($I = ½ mr^2$), and has a radius of .12 meters, and a mass of 1.2 kilograms. Therefore, to solve for the moment of inertia, you can simply plug the given values into the formula: $I = ½ mr^2$ thus getting $½ *1.2 * .12^2 = .00864$. Then, now that you know the I to help get to your final answer. The problem asks for the angular acceleration of a drill with a torque of 80Nm, and now, since you know the I in the equation: t = I a, you can easily solve this. Because you are solving for angular acceleration, you need to reshape the formula to fit your needs: t / I = a. Now, just plug in the numbers: (80Nm)/(.00864) = a $a = 9259.26 rad/s^2 = 9300 rad/s^2$ (Table of contents) 7. A 34.2 gram marble rolls from rest down a ramp that loses 67.5 cm of height. What is the final velocity of the marble? What is its rotational kinetic energy at the bottom, and what is its translational kinetic energy at the bottom? Assuming the ramp was linear and 3.56 m long, and the marble had a radius of .342 cm, what was the angular acceleration of the marble as it moved down the incline? I am going to use energy to solve this, as it is my favorite way. Assuming the marble starts at rest, it has only potential energy at the top of the plane, and at the bottom, as it is rolling, it has both translational and rotational kinetic energy. So our energy equation looks like: mgh = = 1/2mv2 + 1/2Iw2   I am going to substitute to get rid of angular quantities.I = 2/5mr2 for a sphere, and w = v/r: mgh = 1/2mv2 + 1/2(2/5mr2)(v/r)2   mgh = 1/2mv2 + 1/2(2/5mr2)(v2/r2) cancel the r2 mgh = 1/2mv2 + 1/2(2/5m)(v2) mgh = 1/2mv2 + (2/10m)(v2) = 7/10mv2   mgh = 7/10mv2 finally cancel the m gh = 7/10v2 so the final velocity is v = Ö(10gh/7) = 3.0741 m/s Now we can find the angular velocity of the marble: (just for fun!!!!)w = v/r = (3.0741 m/s)/(.342x10-2 m) = 898.8553303 rad/s The rotational kinetic energy can be found from the linear velocity if we follow the substitutions: Ekrot = 1/2Iw2 = 1/2(2/5mr2)(v/r)2 = (2/10m)(v2) = 2/10(.0342 m)(3.0741 m/s)2 = 0.06464 J Now let's find the translational kinetic energy: KE = 1/2(.0342)(3.0741 m/s)2 = 0.1616 J To find the angular acceleration, I am going to find the linear acceleration of the ball as it went down the plane, and then use a tangential relationship to find the angular acceleration:v2 = u2 + 2as   :u = 0; s = 3.56 m; v = 3.0741 m/s a = 1.327 m/s/s a = a/r = (1.327 m/s/s)/(.342x10-2 m) = 388 rad/s/s (Table of contents) 8. A uniform cylinder with a mass of 5.6 kg and a radius of .32 m is free to rotate about a horizontal axis. There is a weight of 92 grams tied to a string that is wrapped around the cylinder. The weight accelerates toward the ground. What is the moment of inertia of the cylinder? What is the angular velocity of the cylinder when it has completed one revolution? What was the cylinder's angular acceleration as the weight fell? The moment of inertia of the cylinder is 1/2mr2 = 1/2(5.6 kg)(.32 m)2 = 0.287 kgm2 I am (no surprise) going to use energy again. The potential energy of the mass that falls is converted into kinetic energy of the mass, and rotational kinetic energy of the pulley: mgh = 1/2mv2 + 1/2Iw2 but the translational kinetic energy belongs solely to the falling mass, and the rotational kinetic energy is that of the cylinder. Let M be the mass of the cylinder, and r be its radius, and m be the falling mass: Substituting to linear quantities: w = v/r I = 1/2mr2 mgh = 1/2mv2 + 1/2(1/2Mr2)(v/r)2 mgh = 1/2mv2 + 1/4Mv2 We cannot cancel the masses as m is the falling mass, and M is the cylinder mass, but we can do a little factoring: mgh = v2(1/2m + 1/4M) v2 = mgh/(1/2m + 1/4M) The problem asks about after the cylinder has completed one revolution, and we need the height, so the change in height of the falling mass would be one circumference: h = circumference of pulley = 2pr = 2p(.32 m) = 2.0106 m v = Ö{mgh/(1/2m + 1/4M)} = Ö{(.092 kg)(9.8 m/s/s)(2.0106 m)/(1/2(.092 kg) + 1/4(5.6 kg))} = 1.1197 m/s Now we can find the angular final velocity using tangential relationships:w = v/r = (1.1197 m/s)/(.32 m) = 3.49895011 rad/s = 3.5 rad/s To find the angular acceleration of the pulley as the mass fell, let's find the linear acceleration of the falling mass (which is also the tangential acceleration of the cylinder, as the string is wrapped around the edgev2 = u2 + 2as :   u = 0; s = 2.0106 m; v = 1.1197 m/s a = 0.3118 m/s/s a = a/r = (0.3118 m/s/s)/(.32 m) = 0.974 rad/s/s (Table of contents) 9. In figure 8-44 (on page 237) the cylindrical pulley has a mass of 5.21 kg, a radius of .450 m, mass 1 is 7.82 kg, and mass 2 is 5.34 kg Mass 2 is resting on the ground, and mass 1 is 17.2 cm above the ground. Calculate the vertical acceleration of the masses, and the speed at which mass 1 hits the ground. Before After Energy time. The potential energy of mass 1 goes to the translational kinetic energies of both masses and to the rotational kinetic energy of the pulley as well as the potential energy of mass 2, just before mass 1 strikes the ground: m1gh = 1/2m1v2 +1/2m2v2 + m2gh + 1/2Iw2 Substitute for the rotational term:w = v/r I = 1/2mr2 m1gh = 1/2m1v2 +1/2m2v2 + m2gh + 1/2(1/2Mr2)(v/r)2 m1gh = 1/2m1v2 +1/2m2v2 + m2gh + 1/4Mv2 Now solve for the final velocity: m1gh -m2gh = 1/2m1v2 +1/2m2v2 + 1/4Mv2 m1gh -m2gh = v2(1/2m1 +1/2m2 + 1/4M) gh(m1 -m2) = v2(1/2m1 +1/2m2 + 1/4M) gh(m1 -m2)/(1/2m1 +1/2m2 + 1/4M) = v2 v = Ö{gh(m1 -m2)/(1/2m1 +1/2m2 + 1/4M)} v = Ö{(9.80 m/s/s)(.172 m)((7.82 kg) -(5.34 kg))/(1/2(7.82 kg) +1/25.34 kg) + 1/4(5.21 kg))} v = 0.72823 m/s Now to calculate the linear acceleration of the masses:v2 = u2 + 2as   :u = 0; s = .172 m; v = 10.72823 m/s a = 1.54 m/s/s(Table of contents) 10. What is the angular momentum of a gyroscope that is a solid cylinder with a radius of .24 m, a mass of 15 Kg and a angular velocity of 140 rad/sec The formula for angular momentum is the direct analog for linear momentum p = mv: L = Iw We need to calculate the moment of inertia.   I = 1/2mr2 I = 1/2(15 kg)(.24 m)2 = 0.432 kgm2 Now calculate the angular momentum:L = Iw = (0.432 kgm2)(140 rad/s) = 60.48 kgm2/s (Table of contents) 11. A ballerina spinning at 1.2 rev/sec with a moment of inertia of 2.6 Kgm2 pulls her arms in so that her new moment of inertia is 1.8 Kgm2. What is her new angular speed? This is a conservation of angular momentum problem. The angular kinetic energy would not be conserved as the ballerina would do work in pulling in her arms that would be manifested as rotational kinetic energy. (it would go up) Now, the formula for angular momentum is:L = Iw So basically, L before = L after:I1w1 = I2w2 (2.6 Kgm2)(1.2 rev/sec) = (1.8 Kgm2)w2 w2 = 1.73rev/s Note that the units cancel, so we don't have to convert to radians per second(Table of contents) 12. A group of children playing on a merry go round spinning at 52 rpm with a moment of inertia of 200 Kgm2 move to its center so that the new moment of inertia is 120 Kgm2. What is the new angular speed? This is a conservation of angular momentum problem. The angular kinetic energy would not be conserved as the ballerina would do work in pulling in her arms that would be manifested as rotational kinetic energy. (it would go up) Now, the formula for angular momentum is:L = Iw So basically, L before = L after:I1w1 = I2w2 (200 Kgm2)(52 RPM) = (120 Kgm2)w2 w2 = 86.7 RPM Note that the units cancel, so we don't have to convert to radians per second(Table of contents) 13. A figure skater spinning at 3.4 rad/sec with a moment of inertia of 3.2 Kgm2 puts his arms out so that his new moment of inertia is 4.5 Kgm2. What is his new angular speed? So basically, L before = L after: I1w1 = I2w2 (3.2 Kgm2)(3.4 rad/s) = (4.5 Kgm2)w2 w2 = 2.42 rad/s Note that the units cancel, so we don't have to convert to radians per second(Table of contents) Explore the world of rotational kinetic energy with our free printable Science worksheets. Discover essential concepts and enhance your students' understanding through these comprehensive and interactive resources. rotational kinetic energy summary Rotational Kinetic Energy XI DPP-39 ROTATION MOTION (Rotational Kinetics) Rotational Kinetic Energy Physics Fast Facts: Work and Energy Rotational Kinetic Energy Mr. Zucca's Rotational Quizizz Moment of Inertia and Rotational Kinetic Energy AP Quiz Rotational motion Version 2 4.1, 4.2, and 4.3 Science Fast Physics Facts Part 2 Rotational Kinetic Energy Physics Fast Facts: Work and Energy Rotational kinetic energy worksheets are an excellent resource for teachers looking to engage their students in the fascinating world of Science and Physics. These worksheets provide a comprehensive and interactive approach to understanding the principles of rotational motion, energy conservation, and the relationship between torque and angular momentum. 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