Exam 3 Redo on APR 14 2014 - Physics 105 – R. Schad

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|  | A graph of position versus time for an object oscillating at the free end of a horizontal spring is shown below.  A point or points at which the object has **maximum positive velocity and zero acceleration** is(are):  PSE1514  **a.** B  **b.** C  **c.** D  **d.** B and D  **e.** E |

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|  | Two identical masses M are a distance of 1m [center-to-center] apart and exert a gravity pull on each other of 10 N.  If you wanted to double the gravity force which  combination of distance change and change of both masses would do the trick?   * 1. Same M, R x ½   2. M x 1.4, R / 1.4   3. M x 2, R x 1.4   4. M x 2, R / 1.4   5. M / 1.4, R x 1.4   6. M / 2, R x 1.4   7. M / 2, R / 1.4   8. None of the above |

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|  | A figure skater spins around her vertical axis, doing a pirouette, initially with her arms and the other leg stretched out. Then she pulls arms and leg closer to her.  Her original spinning speed was  = 10 rad/s and moment of inertia was I = 9 kgm2. After pulling arms and leg closer her spinning speed now is  = 30 rad/s  Her moment of inertia now is:   1. 1.0 kgm2 2. 2.0 kgm2 3. 3.0 kgm2 4. 3.3 kgm2 5. 4.0 kgm2 6. 5.0 kgm2 7. 6.7 kgm2 8. 10 kgm2 9. 13.3 kgm2 10. 16.7 kgm2 |

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|  | A mass on a spring oscillates according the figure above.  The system would have maximum kinetic energy and maximum acceleration at:   1. t = 0 s 2. t = 0.5 s 3. t = 1 s 4. t = 2 s 5. t = 2.5 s 6. t = 3 s 7. never |

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|  | The rigid object shown can rotate about either of its three symmetry axes, horizontal, vertical or out of plane. [Neglect the mass of the connecting rods and treat the masses as point-like particles]  Rank the momenta of inertia for those 3 cases.  PSE1005   1. Ih < Iv < Ioop 2. Ih = Iv = Ioop 3. Ih = Iv < Ioop 4. Iv < Ih < Ioop 5. Iv < Ih = Ioop 6. Ih = Iv > Ioop 7. Ih > Iv > Ioop |

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|  | A mass on a spring with spring constant of 10 N/m oscillates with a frequency of 20 Hz.  For the same mass on a different spring, the frequency is 40 Hz.  That different spring’s spring constant is:   * + 1. 80 N/m     2. 40 N/m     3. 20 N/m     4. 10 N/m     5. 5 N/m     6. 2.5 N/m |

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|  | Mass m1 and m2 [m1 = 1 kg] start from rest at the left amplitude Ai = 10 cm and are pushed by the spring to the right towards the equilibrium.  m2 is not attached and keeps on moving at constant speed. m1 swings out to the right, up to the amplitude of its oscillation.  That amplitude position is 5 cm.  Mass-2 then must be   * 1. ¼ kg   2. ½ kg   3. 1 kg   4. 1.4 kg   5. 2 kg   6. 3 kg   7. 4 kg   8. 5 kg   9. None of these |

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|  | Xxxxxxxxxxxxxxxx  A polar bear of 500 kg stands on an ice floe [slab of ice] with the floe fully submersed but the polar bear fully above the water. The density of ice is 900 kg/m3, and that of water is 1000 kg/m3.  The volume of the ice floe is:   * + 1. 2 m3     2. 0.5 m3     3. 1.8 m3     4. 5 m3     5. 0.55 m3 |

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| velocity  acceleration  gravitational acceleration | **v** = d**x**/dt  **a** = d**v**/dt  **a** = g = 9.8 m/s2 downwards | | |
| Kinematics  (1-dimensional) | **v**f = **v**i + **a**·t  **x**f = **x**i + **v**i·t + ½·**a**·t2  **v**f2 = **v**i2 + 2**a**·(**x**f – **x**i) | | |
| Projectile Motion  (2-dimensional) | vxf = vxi  xf = xi + vxi ⋅t | | vyf = vyi + a · t  vyf2 = vyi2 + 2ay·(yf – yi)  yf = yi + vyi·t + ½ · a · t2 |
| Newton’s Law | | **F** = m·**a**  **F**12 = - **F**21 [action / reaction in opposite directions] | | |
| Friction | | Ffriction = FN  | | |
| Radial Force for circular motion | | Fradial = mv2/r | | |
| Hooke’s Law (spring force) | | Fspring = -k x | | |
| Conservation of Energy | | Ki + Ui + Win/out = Kf + Uf | | |
| Energy | | Kinetik (linear): Klin = ½ mv2  Kinetik (rotation): Klin = ½ I2  Potential (gravity): Ug = m g h  Potential (spring): Us = ½ k x2 | | |
| Work | | W = | | |
| Power | | P = W/t = E/t | | |
| momentum | | **p** = m **v** | |
| conservation of momentum | | **p**1i + **p**2i = **p**1f + **p**2f | |
| impulse (change of momentum) | | **p** = | |
| Radial Force | | Fradial = mv2/r = 2 r | |
| Frequency, Period | | f = revolutions/s = 1/T = /2 | | |
| Angle in radians | | 2 rad = 360° = 1 revolution | | |
| Torque | | **** = **F** x **r** = F r sin | | |
| Newton’s Law of Rotation | | **** = I **** | | |
| Momentum of Inertia ('mass' for rotation) | | I =  or | | |
| Rotational Kinematics | | f = i + ·t  f = i + i·t + ½··t2  f2 = i2 + 2·(f – i) | | |
| Angular momentum  Is conserved, unless a torque acts on the object | | L = I  | | |
| Hooke’s Law (spring force) | | Fspring = -k x | | |
| Oscillation | | x = A cos(t + ) v = - A sin(t + ) a = - A2 cos(t + ) | | |
| Oscillation frequency spring  pendulum | |  | | |
| Density |  = m/V | | |
| Pressure  Hydrostatic pressure | P = F / A  P =  g h | | |
| Buoyant force | Fb = fluid ⋅ Vobject ⋅ g | | |
| Law of Gravitation | FGr = G (m1⋅m2) / r2 G = 6.673 ⋅ 10-11 Nm2/kg2  UGr = **-** G (m1⋅m2) / r r measured from center | | |
| quadratic equation x2 + px + q = 0 | | x1,2 = -p/2 ± (p2/4 - q)1/2 | | |