BONUS HM due date Dec 12 noon **Bonus MAX Worth 4%**
DO not drop off – enter answers using onlne template.

This is bonus review task — it covers all the chapters discussed in class with the exception of chapter 22 /At this point (Nov 16) I cannot anticipate how much of it will be covered by us in during the lectures./

I have never done this before. Since the other bonus scoring activities were marred by the technical difficulties (mine own fault and the new software) , I decided to give you something you could do as extra, to bring up your bonus marks to the level similar to students who took this course in previous years.

I hope you will find this solution agreeable.

This is directly linked to your review efforts, which would have start soon anyway.

The online template to enter the answers to these questions will appear in the last week of classes, meanwhile work on this material as you progress through the review of the course.

1. Five motion diagrams in which points represent the positions of an object at equal time intervals are shown below. Which statement is correct?

a. A has the greatest speed and the greatest acceleration.
b. C has decreasing speed.
c. D slows down and then speeds up.
d. D speeds up and then slows down.

2 A juggler throws two balls to the same height so that one is at the halfway point going up when the other is at the halfway point coming down. At that point:

a. Their velocities and accelerations are equal.
b. Their velocities are equal but their accelerations are equal and opposite.
c. Their accelerations are equal but their velocities are equal and opposite.
d. Their velocities and accelerations are both equal and opposite.
e. Their velocities are equal to their accelerations.

3. A ball is thrown horizontally from the top of a building 0.10 km high. The ball strikes the ground at a point 65 m horizontally away from and below the point of release. What is the magnitude of velocity of the ball just before it strikes the ground?

a. 43 m/s **b.** 47 m/s **c.** 39 m/s **d.** 36 m/s **e.** 14 m/s

4. A 6.0-kg object is suspended by a vertical string from the ceiling of an elevator which is accelerating upward at a rate of 1.8 m/s^2. Determine the tension in the string.

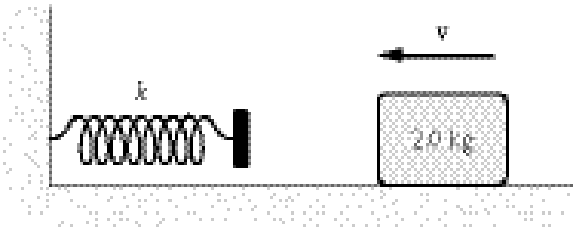
a. 11 N **b.** 70 N **c.** 48 N **d.** 59 N **e.** 62 N

5. A stunt pilot weighing 0.70 kN performs a vertical circular dive of radius 0.80 km. At the bottom of the dive, the pilot has a speed of 0.20 km/s which at that instant is not changing. What force does the plane exert on the pilot?

a. 3.6 kN up **b.** 4.3 kN up **c.** 2.9 kN down **d.** 2.9 kN up **e.** 5.8 kN down

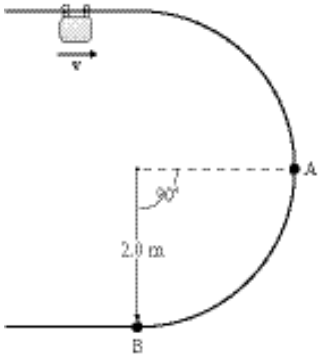
6. The horizontal surface on which the 2.0-kg block slides is frictionless. The speed of the block before it touches the spring is 6.0 m/s. How fast is the block moving at the instant the spring has been compressed 15 cm? k = 2.0 kN/m

a. 3.7 m/s
b. 4.4 m/s
c. 4.9 m/s
d. 5.4 m/s
e. 14 m/s



7. A 1.2-kg mass is projected down a rough circular track (radius = 2.0 m) as shown. The speed of the mass at point A is 3.2 m/s, and at point B, it is 6.0 m/s. How much work is done on the mass between A and B by the force of friction?

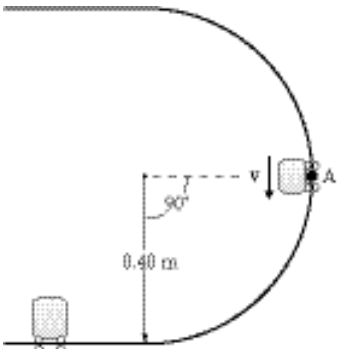
a. -8.9 J
b. -7.3 J
c. -8.1 J
d. -6.6 J
e. -24 J



8. A rocket engine consumes 450 kg of fuel per minute. If the exhaust speed of the ejected fuel is 5.2 km/s, what is the thrust of the rocket?

a. 42 kN
b. 39 kN
c. 45 kN
d. 48 kN
e. 35 kN

9. A 3.0-kg mass is released from rest at point A of a circular frictionless track of radius 0.40 m as shown in the figure. The mass slides down the track and collides with a 1.4-kg mass that is initially at rest on a horizontal frictionless surface. If the masses stick together, what is their speed after the collision?

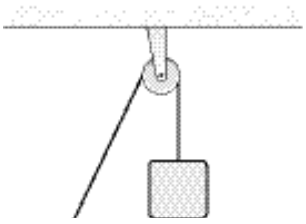


a. 2.1 m/s
b. 1.7 m/s
c. 1.9 m/s
d. 1.5 m/s
e. 2.3 m/s

10. A rocket moving in outer space maintains a constant acceleration (magnitude = 20 m/s^2) while ejecting fuel at a speed of 15 km/s relative to the rocket. If the initial mass of the rocket is 3000 kg, what is the magnitude of the thrust after 800 kg of fuel have been consumed?

a. 56 kN **b.** 48 kN **c.** 52 kN **d.** 44 kN **e.** 36 kN

11. A wheel (radius = 0.20 m) is mounted on a frictionless, horizontal axis. A light cord wrapped around the wheel supports a 0.50-kg object, as shown in the figure. When released from rest the object falls with a downward acceleration of 5.0 m/s^2. What is the moment of inertia of the wheel?

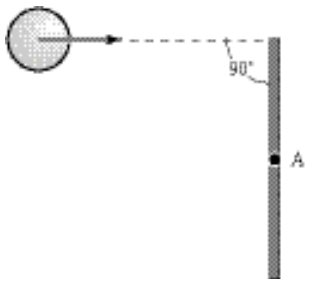


a. 0.023 $kg \cdot m^2$
b. 0.027 $kg \cdot m^2$
c. 0.016 $kg \cdot m^2$
d. 0.019 $kg \cdot m^2$
e. 0.032 $kg \cdot m^2$

12. A uniform rod of length (L = 2.0 m) and mass (M = 1.5 kg) is pivoted about a horizontal frictionless pin through one end. The rod is released from rest at an angle of 30° below the horizontal. What is the angular speed of the rod when it passes through the vertical position? (The moment of inertia of the rod about the pin is 2.0 kg-m^2.)

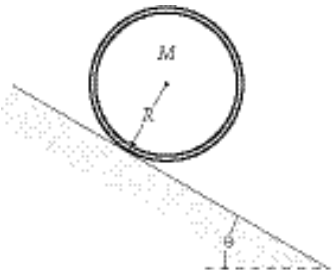
a. 3.5 rad/s **b.** 2.7 rad/s **c.** 3.1 rad/s **d.** 2.3 rad/s **e.** 1.6 rad/s

13. A thin rod of mass M and length L is struck at one end by a ball of clay of mass m, moving with speed v as shown in the figure. The ball sticks to the rod. After the collision, the angular momentum of the clay-rod system about A, the midpoint of the rod, is



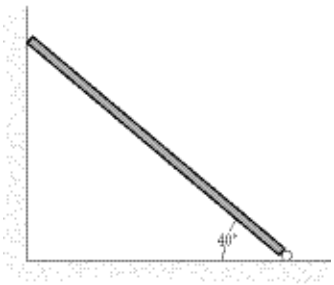
a. $(m + M/3)(vL/2)$
b. $(m + M/12)(vL/2)$
c. $(m + M/6)(vL/2)$
d. $mvL/2$
e. mvL

14. A cylindrical shell rolls without slipping down an incline as shown in the figure. The linear acceleration of its center of mass is



a. $(5/7)g \sin q$
b. $(1/2)g \sin q$
c. $(3/5)g \sin q$
d. $(2/3)g \sin q$
e. $(4/5)g \sin q$

15. A uniform beam having a mass of 60 kg and a length of 2.8 m is held in place at its lower end by a pin. Its upper end leans against a vertical frictionless wall as shown in the figure. What is the magnitude of the force the pin exerts on the beam?



a. 0.68 kN
b. 0.57 kN
c. 0.74 kN
d. 0.63 kN
e. 0.35 kN

16. A Boeing 737 airliner has a mass of 20,000 kg and the total area of both wings (top or bottom) is 100 m^2. What is the pressure difference between the top and bottom surface of each wing when the airplane is in flight at a constant altitude?

a. 1960 N/m^2
b. 3920 N/m^2
c. 7840 N/m^2
d. 4560 N/m^2
e. 3070 N/m^2

17. A hydraulic lift raises a 2000-kg automobile when a 500-N force is applied to the smaller piston. If the smaller piston has an area of 10 cm^2, what is the cross-sectional area of the larger piston?

a. 40 cm^2
b. 80 cm^2
c. 196 cm^2
d. 392 cm^2
e. 160 cm^2

18. Water pressurized to 3.5×10^5 Pa is flowing at 5.0 m/s in a horizontal pipe which contracts to 1/3 its former area. What are the pressure and velocity of the water after the contraction?

a. 2.5×10^5 Pa, 15 m/s
b. 3.0×10^5 Pa, 10 m/s
c. 3.0×10^5 Pa, 15 m/s
d. 4.5×10^5 Pa, 1.5 m/s
e. 5.5×10^5 Pa, 1.5 m/s

19. One mole of an ideal gas is held at a constant volume of 1 liter. Find the change in pressure if the temperature increases by 50°C.

a. 3 atm **b.** 4 atm **c.** 2 atm **d.** 1 atm **e.** 5 atm

20. A bubble having a diameter of 1.00 cm is released from the bottom of a swimming pool where the depth is 5.00 m. What will the diameter of the bubble be when it reaches the surface? The temperature of the water at the surface is 20.0°C, whereas it is 15.0°C at the bottom. (The density of water is 1.00×10^3 kg/m^3.)

a. 1.05 **b.** 1.15 **c.** 1.45 **d.** 1.65 **e.** 1.35

21. If 25 kg of ice at 0°C is combined with 4 kg of steam at 100°C, what will be the final equilibrium temperature (in °C) of the system?

a. 40 **b.** 20 **c.** 60 **d.** 100 **e.** 8

22. Five moles of an ideal gas expands isothermally at 100°C to five times its initial volume. Find the heat flow into the system.

a. 2.5×10^4 J **b.** 1.1×10^4 J **c.** 6.7×10^3 J **d.** 2.9×10^3 J **e.** 7.0×10^2 J

23. Gas in a container expands at a constant pressure of 3 atm. Find the work done (in J) by the gas if the initial volume is 5 liters and the final volume is 10 liters.

a. 0 **b.** 150 **c.** 15 **d.** 1500 **e.** 1.5

24. Gas in a container increases its pressure from 1 atm to 3 atm while keeping its volume constant. Find the work done (in J) by the gas if the volume is 5 liters.

a. 0 **b.** 3 **c.** 5 **d.** 15 **e.** 15×10^2

25 During an adiabatic compression, a volume of air decreases to 1/4 its original size. Calculate its final pressure if its original pressure was 1 atm. (Assume the air behaves like an ideal gas with g = 1.4.)

a. 7.0 **b.** 5.6 **c.** 3.5 **d.** 2.2 **e.** 0.14

26. An ideal gas is allowed to expand adiabatically until its volume increases by 50%. By approximately what factor is the pressure reduced? (g = 5/3.)

a. 1.5 **b.** 2.0 **c.** 2.5 **d.** 3.0 **e.** 3.5

27. The specific heat at constant volume at 0°C of one mole of an ideal monatomic gas is

a. $\frac{1}{2}R$ **b.** R. **c.** $\frac{3}{2}R$. **d.** $2R$. **e.** $\frac{5}{2}R$.

28. The specific heat at constant volume at 0°C of one mole of an ideal diatomic gas is

a. $\frac{1}{2}R$. **b.** R. **c.** $\frac{3}{2}R$. **d.** $2R$. **e.** $\frac{5}{2}R$.