Exam #2 ---- (momentum, work, energy, rotation, etc.)

24. A green ball moving to the right at 3 m/s strikes a yellow ball moving to the left at 2 m/s. If the balls are equally massive and the collision is elastic,
A. the green ball will move to the left at 3 m/s while the yellow ball moves right at 2 m/s.
B. the green ball will move to the left at 2 m/s while the yellow ball moves right at 3 m/s.
C. The green ball will stop while the yellow ball moves right at 2 m/s.
D. The yellow ball will stop while the green ball moves left at 3 m/s.
E. Both balls will stick together and move to the right at 1 m/s.

25. An impulse of 100 N-s is applied to an object. If this same impulse is delivered over a longer time interval,
A. the force involved will be decreased.
B. the force involved will be increased.
C. the momentum transferred will be increased.
D. the momentum transferred will be decreased.
E. the acceleration involved will be increased.

26. Case 1: A net force of 10 N acts on a mass of 1 kg for a time of 0.2 s.
Case 2: A net force of 20 N acts on a mass of 1 kg for a time of 0.2 s.
Both cases result in acceleration of the mass. In comparison, Case 1 and Case 2 will
A. involve the same impulse and produce the same acceleration.
B. involve the same impulse and produce different accelerations.
C. involve different impulses and produce different accelerations.
D. involve different impulses and produce the same acceleration.
E. produce the same change of momentum.

27. Momentum is the product of
A. mass and velocity.
B. mass and acceleration.
C. velocity and acceleration.
D. force and inertia.
E. force and velocity.

28. If a moving object cuts its speed in half, how much momentum will it have?
A. the same amount as before
B. twice as much as before
C. one half as much as before
D. four times as much as before
E. one fourth as much as before

29. A 1-kg ball moving horizontally to the right at 3 m/s strikes a wall and rebounds,

moving horizontally to the left at the same speed. What is the magnitude of the change in momentum of the ball?
A. 0 kg-m/s
B. 2 kg-m/s
C. 3 kg-m/s
D. 4 kg-m/s
E. 6 kg-m/s

30. Potential energy is the energy possessed by an object due to
A. its momentum.
B. its position.
C. its velocity.
D. its acceleration.
E. its shape.

31. Which of the following is true?
A. A body with zero velocity cannot have any potential energy.
B. A body with zero acceleration cannot have any kinetic energy.
C. A body with zero acceleration cannot have any potential energy.
D. A body with zero velocity cannot have any kinetic energy.
E. A body with zero potential energy cannot have any velocity.

32. If two objects of different mass have the same non-zero momentum,
A. the one with less mass will have the greater kinetic energy.
B. the one with more mass will have the greater kinetic energy.
C. they will have the same kinetic energy.
D. the one with the higher speed will have the greater mass.
E. the one with the lower speed will have the greater kinetic energy.

33. A car traveling at 60 km/hr passes a truck going 30 km/hr that has four times the mass of the car. Which of the following is true?
A. The car and the truck have the same momentum and the same kinetic energy.
B. The car has the same momentum and twice as much kinetic energy as the truck.
C. The car has the same momentum and four times as much kinetic energy as the truck.
D. The car has the same kinetic energy and twice as much momentum as the truck.
E. The car has the same kinetic energy and half as much momentum as the truck.

34. A swinging pendulum has ____ at the bottom (middle) of its arc.
A. minimum kinetic energy
B. minimum total energy
C. minimum potential energy
D. maximum total energy

E. maximum potential energy

35. Real machines are not 100% efficient because
A. some of the energy input is always transformed into thermal energy.
B. some of the energy input is always transformed into gravitational potential energy.
C. the energy input is always less than the energy output.
D. that would require the work output to be 100 times the work input, which is impossible.
E. that would require the work input to be 100 times the work output, which is impossible.

36. A physicist does 100 joules of work on a simple machine that raises a box of books through a height of 0.2 meters. If the efficiency of the machine is 60%, how much work is converted to thermal energy by this process?
A. 40 joules
B. 60 joules
C. 80 joules
D. 20 joules
E. 100 joules

37. When you run up two flights of stairs instead of walking up them, you feel more tired because
A. you do more work when you run than when you walk.
B. your power output is greater when you run than when you walk.
C. the gravitational force is greater on a running person than on a walking person.
D. the gravitational acceleration is greater on a running person than on a walking person.
E. a running person has more inertia than a walking person.

38. The work done against gravity in moving a box with a mass of 5 kilograms through a height of 3 meters is
A. 150 joules.
B. 150 newtons.
C. 15 joules.
D. 15 newtons.
E. 5/3 joules.

39. Angular momentum is the product of
A. rotational inertia and rotational velocity.
B. linear momentum and angle.
C. mass and velocity.
D. force and impulse.
E. acceleration and time.

40. When you stand in equilibrium on only one foot,
A. your center of mass will be directly above that foot.
B. your center of mass will be directly above the other foot.
C. your center of mass will be directly above a point equidistant between your two feet.
D. your rotational inertia will be zero.
E. you will always fall over.

41. When a car rounds a curve at high speed,
A. the tires exert a centripetal force on the road.
B. the road exerts a centripetal force on the tires.
C. the car exerts a centripetal force on the road.
D. the car body exerts a centripetal force on the tires.
E. there are no centripetal forces involved.

42. On a spinning disk, points closer to the outer edge will have ____ points near the center.
A. the same rotational speed as and greater tangential speed than
B. the same rotational speed as and lower tangential speed than
C. the same tangential speed as and greater rotational speed than D. the same tangential speed as and lower rotational speed than E. lower rotational speed and higher tangential speed than

43. A merry-go-round rotates 9 times each minute such that a point on its rim moves at a rate of 3 m/s. At a point 2/3 of the way out from the center to the rim, the tangential speed would be ____ .
A. 6 RPM
B. 2 m/s
C. 3 m/s
D. 9 RPM
E. 3 RPM

44. An empty soup can and a full one are rolled side-by-side down an incline. If they start together, which one will reach the bottom first?
A. The empty can arrives first.
B. The full can arrives first.
C. They will arrive together.
D. It depends on the diameters of the cans.
E. It depends on the kind of soup.

45. A mass of 1 kilogram is tied to a string and swung in a horizontal circle of radius 1 meter; if the mass is then decreased to 0.5 kilogram, the rotational inertia of this new

system will be ____ as before.
A. twice as much
B. four times as much
C. the same
D. one half as much
E. one fourth as much

46. Torque is the product of
A. lever arm and force.
B. mass and radius.
C. rotational inertia and velocity.
D. force and velocity.
E. lever arm and rotational inertia.

47. A 60-kg grandfather and his 30-kg granddaughter are balanced on a seesaw. If the granddaughter is sitting 2 meters from the pivot point, the grandfather must be sitting ____ from it.
A. 4 meters
B. 2 meters
C. 3 meters
D. 1 meter
E. 0.5 meter