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Hovercraft

Division B

Score: \_\_\_\_\_\_\_\_\_\_\_\_\_/50

Hovercraft - Division B

Answer Sheet

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Hovercraft - Division B

Written Exam

Part I: Multiple Choice

Each correctly answered question is worth 1 point.

Write the letter that corresponds to your answer to each question on the answer sheet.

**Responses not recorded on the answer sheet will not be graded.**

1. Can an object’s velocity change direction when its acceleration is constant?
   1. No, this is not possible because it is always speeding up.
   2. No, this is not possible because it is always speeding up or slowing down.
   3. Yes, this is possible, and a rock thrown straight up is an example.
   4. Yes, this is possible, and a car that starts from rest, speeds up, slows to a stop, and then backs up in an example.
2. Kinetic energy is
   1. Energy an object has due to its state of motion.
   2. Directly proportional to an object’s mass.
   3. Measured in Joules.
   4. All of the above.
   5. None of the above.
3. An Olympic athlete throws a javelin at four different angles above the horizontal, each with the same speed: 30, 40, 60 and 80-degrees. Which two throws cause the javelin to land the same distance away?
   1. 30 & 80-degrees
   2. 40 & 60-degrees
   3. 40 & 80-degrees
   4. 30 & 60-degrees
4. If you exert a force F on an object, the force which the object exerts on you will
   1. Depend on whether or not the object is moving.
   2. Depend on whether or not you are moving.
   3. Depend on the relative masses of you and the object
   4. Always be F
5. A quantitative measure of the amount of inertia an object contains is
   1. its velocity.
   2. its mass.
   3. its volume.
   4. its acceleration.
6. Ignoring air resistance, the horizontal component of a projectile’s velocity:
   1. is zero.
   2. remains constant.
   3. continuously increases.
   4. continuously decreases.
7. Which of Newton’s laws best explains why motorists should buckle-up?
   1. The first law
   2. The second law
   3. The third law
   4. The law of gravitation
8. The base units for force are:
   1. N
   2. kgm2/s2
   3. kgm/s
   4. kgm/s2
9. At what angle should a water-gun be aimed in order for the water to land with the greatest horizontal range?
   1. 0-degrees
   2. 30-degrees
   3. 45-degrees
   4. 60-degrees
10. A large jet airliner at rest on the runway has more momentum than the small cart rolling past it.
    1. True
    2. False
11. A pilot drops a bomb from a plane flying horizontally at a constant speed. Neglecting air resistance, when the bomb hits the ground the horizontal location of the plane will:
    1. be behind the bomb.
    2. be over the bomb.
    3. be in front of the bomb.
    4. depend on the speed of the plane when the bomb was released.
12. Action-Reaction forces
    1. Sometimes act on the same object
    2. Always act on the same object
    3. May be at right angles
    4. Always act on different objects
13. The base units for energy are:
    1. J
    2. kgm2/s2
    3. kgm/s
    4. kgm/s2
14. As the time it takes an object to slow increases, the force needed to slow it increases as well.
    1. True
    2. False
15. The acceleration of gravity on the Moon is one-sixth of that on Earth. If you hit a baseball on the Moon with the same effort (and at the speed and angle) that you would on Earth, the ball would land:
    1. the same distance away.
    2. one-sixth as far.
    3. 6 times as far.
    4. 36 times as far.
16. The acceleration of an object is inversely proportional to
    1. The net force acting on it
    2. Its position
    3. Its velocity
    4. Its mass
17. Action-Reaction forces
    1. Are always equal.
    2. Are equal and opposite and therefore cancel eachother out.
    3. Only occur on Earth.
    4. Act in the same direction.
18. To maximize the amount of time a projectile is airborne, it should be launched:
    1. at 90-degrees with the horizontal.
    2. at 45-degrees with the horizontal.
    3. with a minimum velocity.
    4. sideways.
19. Mass and inertia are
    1. Directly proportional.
    2. Indirectly proportional.
    3. Inversely proportional.
    4. Not related.
20. The larger the force that acts on an object the larger its change in momentum will be.
    1. True
    2. False
21. Objects A and B initially have the same amount of kinetic energy. The velocity of A is doubled and the mass of B is doubled. How do their kinetic energies now compare?
    1. A has more.
    2. B has more.
    3. They are still equal.
    4. It cannot be determined.
22. The more inertia an object has
    1. The easier it is to move.
    2. The larger its acceleration due a set force.
    3. The more difficult it is to stop.
    4. The easier it is to stop.
23. The base units for impulse are:
    1. Ns
    2. kgm2/s2
    3. kgm/s
    4. kgm/s2
24. If a ball with 10 kgm/s of momentum comes to rest after colliding with an identical ball the second ball now has 10 kgm/s of momentum.
    1. True
    2. False
25. Force is
    1. A push or pull exerted from one object onto another.
    2. Directly proportional to an object’s acceleration.
    3. A vector.
    4. All of the above.
    5. None of the above.
26. Momentum is a conserved quantity and can therefore never be changed.
    1. True
    2. False

Part II: Problem Set

Each correctly answered question is worth **3 points**.

Be sure to record your answer, with correct significant figures and units on the answer sheet to receive credit for your response.

Problems 30, 34, & 33 will be used (in that order) as tie breakers.

1. What is your acceleration if you skid to a stop in 3.00 seconds from an initial velocity of 27 m/s east?
2. Nate is riding his bike south at a constant 19.0 m/s when he reaches the Broad Mountain. He accelerates at a constant rate of 0.50 m/s2 N the entire 250 m to the top. What is his velocity as he crests the mountain?
3. A baseball player throws a ball straight up with an initial velocity of 25 m/s. What will is its velocity when he catches it?
4. While chasing the Road-Running Wile E Coyote sprints off a 32.0 m cliff at a rate of 4.00 m/s. What distance from the base of the cliff will he land?
5. How much force is required to slow a 1250 kg car from 32 m/s to 9 m/s in 3.5 seconds?
6. How much kinetic energy does a 2.1 kg skateboard rolling west at 5.25 m/s?
7. A 85.0 kg base-runner (running at 9.5 m/s N) collides with a 90.0 kg third baseman who was jogging south at 4.5 m/s. What is the runner’s velocity immediately after the collision assuming the third basemen comes to a stop?
8. A 55 kg car is initially driving with a velocity of 10.0 m/s S, when a 45 N N force from the engine acted on it for 7.5 seconds. What is the car’s velocity after the force from the engine?