

FINAL EXAM

Equations:

$$S = S_0 + v \cdot t$$

$$S = S_0 + v_0 \cdot t - 1/2 \cdot 9.81 \cdot t^2$$

$$v = v_0 - 9.81 \cdot t$$

Remember: * Pick the BEST answer to each question.

* Some questions may give you more information than what you need to solve them.

1. The main purpose of the dimples on a golf ball is:
 - (a) to increase the lift force.
 - (b) to allow the ball to spin better.
 - (c) to slow down the rotation of the ball.
 - (d) to reduce drag.
 - (e) to decrease the Magnus effect.

2. During the second half of the takeoff phase of a high jump, the quadriceps muscles of the takeoff leg are mostly in:
 - (a) concentric conditions.
 - (b) eccentric conditions.
 - (c) isometric conditions.

3. You are a diver. You are walking toward the edge of the platform, and you want to perform a forward somersault. To achieve this, you will generally push _____ on the platform during the takeoff phase.
 - (a) downward and forward.
 - (b) downward and backward.
 - (c) directly downward.

4. After takeoff, a diver had angular momentum that made her perform a pure forward somersault. For a short period of time, she kept her legs aligned with the trunk, and the arms extended upward, also aligned with the trunk. She somersaulted forward without twisting about her longitudinal axis. Then, she lowered her left arm following a wide arc out to the side, and placed her left hand against her left thigh. After these actions, she:
 - (a) continued somersaulting, with no twisting.
 - (b) continued somersaulting, but she also acquired a twisting motion that made her right shoulder move forward and her left shoulder move backward.
 - (c) continued somersaulting, but she also acquired a twisting motion that made her right shoulder move backward and her left shoulder move forward.

5. Which one of the following statements is FALSE?
 - (a) Most of the angular acceleration of a golf club occurs in its last 90° of rotation.
 - (b) Most of the angular acceleration of a golf club occurs through a pull-push mechanism.
 - (c) At the end of the backswing, the shaft of the golf club should be roughly horizontal.
 - (d) The loft angle normally gives backspin to the golf ball.

6. A person draws a bowstring, and shoots an arrow at a bird that is passing directly overhead, but misses. Which of the following sequences defines best the energy transformations that take place?

- (a) chemical ---> elastic ---> kinetic ---> potential
- (b) chemical ---> potential ---> kinetic ---> elastic
- (c) potential ---> elastic ---> kinetic --> potential
- (d) potential ---> chemical ---> kinetic ---> elastic
- (e) elastic ---> chemical ---> kinetic ---> potential

7. A person pushes a 93 Kg sled in a series of experiments, exerting:

- (a) a 30 N force for 5 seconds
- (b) a 50 N force for 7 seconds
- (c) an 80 N force for 4 seconds
- (d) a 100 N force for 5 seconds
- (e) a 60 N force for 9 seconds

In which of the five experiments will the sled experience the **smallest** total change in velocity?

8. In most throwing activities, the speed increase of the projectile takes place primarily during the:

- (a) double-support delivery phase.
- (b) preparatory phase.
- (c) follow-through phase.

9. Backspin in a golf ball:

- (a) helps to reduce the air resistance force.
- (b) is associated with a "slice" in a right-handed golfer.
- (c) is associated with a "hook" in a right-handed golfer.
- (d) helps to keep the ball in the air longer.

10. The angular acceleration of a golf club in the **early** stages of the downswing is produced mainly by:

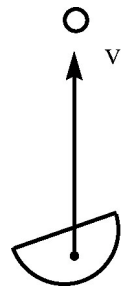
- (a) a couple ("pull-push") exerted by the hands on the grip.
- (b) air resistance.
- (c) a centripetal force ("pull-pull") exerted by the hands on the grip.
- (d) gravity.

11. For safety, while braking a fall:
- (a) it is important to minimize the time during which braking takes place.
 - (b) the length of time during which braking takes place makes little difference.
 - (c) it is important to maximize the time during which braking takes place.
12. If the angular momentum vector of a diver is pointing toward you, you will see overall:
- (a) a counterclockwise rotation.
 - (b) neither clockwise nor counterclockwise rotation.
 - (c) a clockwise rotation.

13. Which of the following statements is FALSE?

The main purpose of the face mask of a hockey goalkeeper is to protect the goalkeeper in a possible impact by the puck, by:

- (a) decreasing the force exerted on the face.
 - (b) decreasing the impulse exerted on the face.
 - (c) spreading the force exerted on the face over a large area.
14. The sketch below shows an overhead view of a golf clubhead about to strike the ball. If we assign the name "forward direction" to the direction of motion of the clubhead immediately before impact, we can say that after impact the ball will:
- (a) initially travel directly forward, and then its path will gradually curve toward the left.
 - (b) initially travel directly forward, and then its path will gradually curve toward the right.
 - (c) initially travel slightly left from the forward direction, and then its path will gradually curve more and more toward the left.
 - (d) initially travel slightly right from the forward direction, and then its path will gradually curve more and more toward the right.



15. Consider a sprinter in the "full speed" part of a race. At an instant immediately after planting the foot on the ground, the force exerted by the sprinter on the ground will point:
- (a) directly forward.
 - (b) directly backward.
 - (c) downward and forward.
 - (d) downward and backward.
 - (e) directly downward.

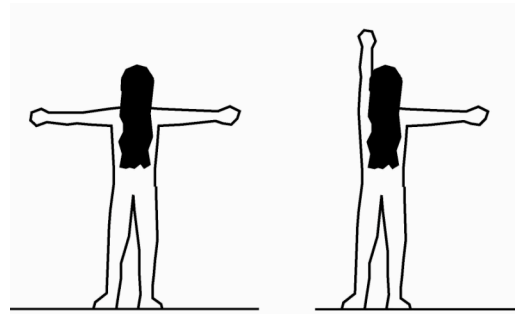
16. The speed of a golf ball immediately after impact is determined by:
- (a) the mass of the clubhead.
 - (b) the speed of the clubhead immediately before impact.
 - (c) the coefficient of restitution ("e") of the impact between the clubhead and the ball.
 - (d) all of the above.

17. Which one of the following statements is FALSE? If they are all true, answer "d".

During a throw, the actions of the legs and trunk contribute to the throw by:

- (a) helping the arm muscles to exert larger forces.
 - (b) helping to increase the range of motion of the projectile.
 - (c) helping to place the arm muscles in faster concentric conditions.
18. A gymnast stands on the floor with her arms stretched out to the sides, forming a cross with the body. Then, the gymnast moves her left arm until it is pointing directly upward. If the rest of the body does not move, what happens to the center of mass of the whole body as a result of this action?

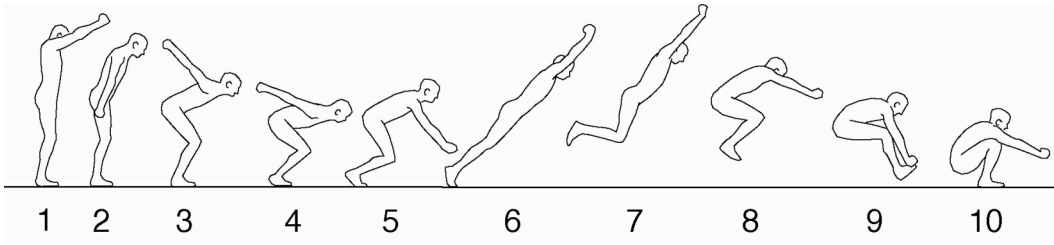
- (a) It moves up and to the right.
- (b) It does not move.
- (c) It moves down and to the left.
- (d) It moves up and to the left.
- (e) It moves down and to the right.



19. In diving, a somersault **with no twist** occurs when the longitudinal axis of the diver is:
- (a) perpendicular to the total angular momentum vector.
 - (b) aligned with the total angular momentum vector.
 - (c) oblique with respect to the total angular momentum vector.
20. Which of the following statements is FALSE? If you think that they are all true, answer "e".
- (a) In the first half of the takeoff phase of a high jump, the athlete should make a large effort trying to resist against the flexing of the takeoff leg.
 - (b) At the end of the run-up the hips of a high jumper should be rather low.
 - (c) During the takeoff phase, a high jumper should swing the arms very hard.
 - (d) At the end of the run-up a high jumper should be running rather fast.

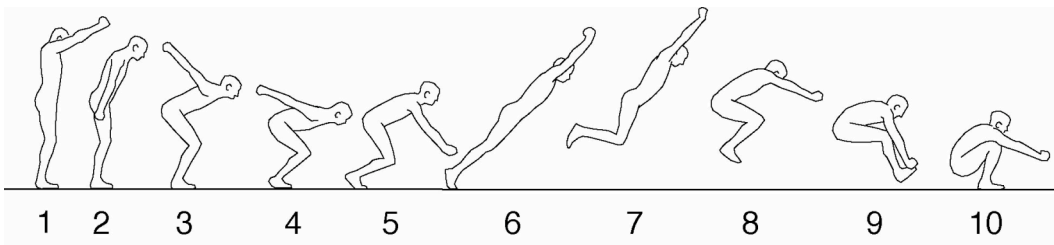
21. In the sequence shown below, if the arms of the jumper were to swing violently clockwise from the position that they have in image 7, to a position behind the body, the feet of the jumper would land:

- (a) nearer to the point of takeoff than in the original jump.
- (b) farther from the point of takeoff than in the original jump.
- (c) at the same distance from the point of takeoff as in the original jump.

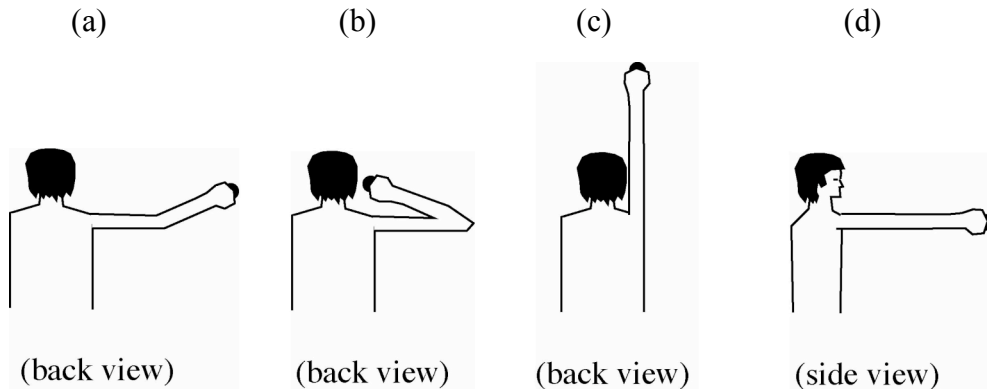


22. In the sequence shown below, the shoulder muscles that are activated at an instant just before the time of image 3 are the same as the muscles that are acting between image 4 and image 5.

- (a) TRUE
- (b) FALSE



23. In an "overarm" throw, the release of the ball takes place in one of the positions shown below. Indicate which one.



24. A discus thrower made two practice throws, and neither one was an “all-out” effort. In the first throw, the athlete's elbow was kept straight throughout the throw. In the second throw, the elbow was kept at a somewhat flexed angle throughout the throw. If the discus had the same linear velocity at release in both throws, this implies that the active muscles of the shoulder:
- (a) shortened faster in the second throw than in the first throw.
 - (b) shortened at the same rate in both throws.
 - (c) shortened faster in the first throw than in the second throw.
25. In swimming, resistive forces are due mainly to:
- (a) a combination of lift and drag.
 - (b) lift.
 - (c) drag.
 - (d) neither lift nor drag.
26. The final angular acceleration of a golf club, shortly before impact, is produced mainly by:
- (a) a couple ("pull-push") exerted by the hands on the grip.
 - (b) air resistance.
 - (c) a centripetal force (“pull-pull”) exerted by the hands on the grip.
 - (d) gravity.
27. The arm of a softball pitcher is rotating at $65^\circ/\text{s}$. The distance between her shoulder and the ball is 0.77 m. What is the linear velocity of the ball?
- (a) between 0.00 m/s and 1.00 m/s
 - (b) between 1.01 m/s and 5.00 m/s
 - (c) between 5.01 m/s and 10.00 m/s
 - (d) between 10.01 m/s and 25.00 m/s
 - (e) more than 25.01 m/s
28. A 200 meter swimming race takes place in a 50 meter pool. Assume that the positive direction is the direction of swimming in the first stretch (first 50 meters). How will the **acceleration** of the swimmer be when the swimmer is slowing down to make his second turn, that is, as he approaches the 100 meter mark?
- (a) negative
 - (b) zero
 - (c) positive

29. A football player kicks the ball, and at the instant of takeoff from the foot the ball has horizontal and vertical velocities of 25.0 m/s and 7.0 m/s, respectively. How long will it take the ball to reach its peak height?
- (a) between 0.00 s and 1.00 s
 - (b) between 1.01 s and 3.00 s
 - (c) between 3.01 s and 7.00 s
 - (d) between 7.01 s and 15.00 s
 - (e) more than 15.01 s
30. A springboard makes it possible for a diver to jump higher, because:
- (a) it allows the diver to transform kinetic energy associated with horizontal motion into kinetic energy associated with vertical motion, and ultimately into potential energy.
 - (b) it allows the diver to expend more chemical energy in the last bounce than what he/she expended in the first bounce.
 - (c) it allows the diver to accumulate the energy from several bounces, which is ultimately transformed into potential energy.
31. If the angular momentum of a body is constant, this always implies that:
- (a) the torque exerted on the body is zero.
 - (b) the moment of inertia of the body is constant.
 - (c) the angular velocity of the body is constant.
 - (d) both (b) and (c).
 - (e) both (a) and (c).