PART ONE Multiple-Choice Practice Exam

Choose the BEST answer to each of the following:

1. The language of science is
   (a) mathematics. (b) Latin. (c) Chinese. (d) Arabic.
2. Somebody who says "That's only a theory" likely doesn't know that a scientific theory is
   (a) an educated guess.
   (b) a hypothesis.
   (c) a vast synthesis of well-tested hypotheses and facts.
   (d) None of these.
3. The force needed to keep a ball rolling along a bowling alley is
   (a) due to gravity.
   (b) an inertial force.
   (c) a slight breeze.
   (d) None of these.
4. The equilibrium rule, $\Sigma F = 0$, applies to objects
   (a) at rest.
   (b) moving at constant velocity.
   (c) Both.
   (d) Neither.
5. If gravity between the Sun and Earth suddenly vanished, Earth would continue moving in
   (a) a curve.
   (b) a straight line.
   (c) an outward spiral.
   (d) an inward spiral.
6. The average speed of a gazelle traveling a distance of 2 km in a time of one-half hour is
   (a) 1 km/h. (b) 2 km/h. (c) 4 km/h. (d) greater than 4 km/h.
7. An object in free fall undergoes an increase in
   (a) speed. (b) acceleration. (c) both speed and acceleration.
8. Two vectors, one 3 N and the other 4 N, can have a resultant of
   (a) 0 N. (b) 5 N. (c) 8 N. (d) Any of these.
9. A 10-N force at an angle 45° above the horizontal has a horizontal component of about
   (a) 7 N. (b) 5 N. (c) 10 N.
10. The fact that the acceleration of free fall is the same for all masses is explained by Newton's
    (a) first law. (c) third law.
    (b) second law. (d) law of action–reaction.
11. The amount of air drag on an 0.8-N flying squirrel dropping vertically at terminal velocity is
    (a) less than 0.8 N.
    (b) 0.8 N.
    (c) greater than 0.8 N.
    (d) dependent on the orientation of its body.
12. When a cannonball is fired from a cannon, both the cannonball and the cannon experience equal
    (a) amounts of force. (b) accelerations. (c) Both. (d) Neither.
13. The team that wins in a tug-of-war is the team that
    (a) produces more tension in the rope than the opponent.
    (b) pushes hardest on the ground.
    (c) Both.
    (d) Neither.
14. An airplane with its nose pointing north with an airspeed of 40 km/h in a 30-km/h crosswind (at right angles) has a groundspeed of
    (a) 30 km/h. (b) 40 km/h. (c) 50 km/h. (d) 60 km/h.
15. The impulse–momentum relationship is a direct result of Newton's
    (a) first law. (b) second law. (c) third law. (d) law of gravity.
16. A big fish swims upon and swallows a small fish that is at rest. Right after lunch, the fattened big fish has a change in
    (a) speed. (b) momentum. (c) Both. (d) Neither.
17. The work done on a 100-kg crate that is hoisted 2 m in a time of 4 s is
    (a) 200 J. (b) 500 J. (c) 800 J. (d) 2000 J.
18. The power required to raise a 100-kg crate a vertical distance of 2 m in a time of 4 s is
    (a) 200 W. (b) 500 W. (c) 800 W. (d) 2000 W.
19. When a model car speeds up to three times its original speed, its kinetic energy is
    (a) the same.
    (b) twice as great.
    (c) three times greater.
    (d) None of these.
20. Lift a 100-N crate with an ideal pulley system by pulling a rope downward with 25 N of force. For every 1-m length of rope pulled down, the crate rises
    (a) 25 cm. (b) 25 m. (c) 50 cm. (d) None of these.
21. When 100 J are put into a device that puts out 40 J of useful work, the efficiency of the device is
    (a) 40%. (b) 50%. (c) 60%. (d) 140%.
22. A machine cannot multiply
    (a) forces. (b) distances. (c) energy. (d) None of these.
23. When a tin can is whirled in a horizontal circle, the net force on the can acts
    (a) inward. (b) outward. (c) upward. (d) None of these.
24. A torque is a force
    (a) like any other force.
    (b) multiplied by a lever arm.
    (c) that is fictitious.
    (d) that accelerates things.
25. The rotational inertia of an object is greater when most of the mass is located
    (a) near the rotational axis. (b) away from the axis.
    (c) on the rotational axis. (d) off center.
26. If the Sun were twice as massive, its pull on Mars would be
    (a) unchanged. (b) twice as much.
    (c) half as much. (d) four times as much.
27. The highest ocean tides occur when Earth and the Moon are
    (a) lined up with the Sun.
    (b) at right angles to the Sun.
    (c) at any angle to the Sun.
    (d) lined up during spring.
28. The component of velocity that can remain constant for a tossed baseball is
    (a) horizontal.
    (b) vertical.
    (c) Either of these.
    (d) None of these.
29. The magnitude of the gravitational force on a satellite is constant if the orbit is
    (a) parabolic. (b) circular. (c) elliptical. (d) All of these.
30. A satellite in Earth orbit is above Earth's
    (a) atmosphere. (b) gravitational field. (c) Both. (d) Neither.

After you have made thoughtful choices, and discussed them with your friends, find the answers on page S-1.