Unit 7 Test – Motion & Force [Part1] Name _____

Word Problems – 45 pts

1. The starting linebacker for the NOHS Titans tips the scales at 950N. What is his mass in kg?

$m = \frac{W}{g} = \frac{950N}{10\frac{m}{s^2}} = \boxed{95\,kg}$

2. A net force of 15N is exerted on a physical science textbook that's causes it to accelerate at a rate of 5.5 m/s^2. What is the mass of the book?

$m = \frac{F}{a} = \frac{15N}{5.5\frac{m}{s^2}} = \boxed{2.73\,kg}$

3. What is the momentum of a 0.14kg baseball with a speed of 36m/s?

$p = mv = 0.14kg \times 36\frac{m}{s} = \boxed{5.04\,\frac{kgm}{s}}$

4. On April 15, 1912, the Titanic sank after running into an iceberg. What was the ships speed when it collided with the iceberg if the ship had a mass of 423,000,000 kg and a momentum of 4,900,000,000 kgm/s?

$V = \frac{P}{m} = \frac{4,900,000,000\ \frac{kgm}{s}}{423,000,000\ kg} = \boxed{11.6\frac{m}{s}}$

5. Connor and AJ are playing tug of war. If Connor pulls on the rope with 7N of force towards the left and AJ pulls on the rope with 4N of force towards the right, what is the net force applied to the rope?

$\begin{array}{r} -7 \\ +4 \\ \hline -3 \end{array}$ $\boxed{-3N}$

6. Find the acceleration of a car that goes from 35m/s to 96m/s in 8.5 seconds.

$a = \frac{Vf - Vi}{t} = \frac{96\frac{m}{s} - 35\frac{m}{s}}{8.5s} = \boxed{7.17\frac{m}{s^2}}$

7. A 300N force acts on a 24kg object. What is the acceleration of the object?

$a = \frac{F}{m} = \frac{300N}{24kg} = \boxed{12.5\frac{m}{s^2}}$

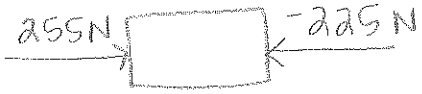
8. A runner finished a 10K race [10km] in 42 minutes, what was his average speed?

$V = \frac{d}{t} = \frac{10km}{42m} = \boxed{0.24\,\frac{km}{m}}$

9. What is the force on an object that has a mass of 12kg and an acceleration of $4m/s^2$?

$F = ma = 12kg \times 4\frac{m}{s^2} = \boxed{48N}$

10. You and your friend are trying to move a large box, you are pushing 255N of force to the right and your friend is pushing 225N of force to the left. What is the net force applied to the box?



$$\begin{array}{r} 255\,N \\ -225\,N \\ \hline 30\,N \end{array}$$

30 N →

11. A high-speed train travels with an average speed of 227km/h. How far does the train travel in 2 hours?

$d = st = 227\frac{km}{h} \times 2h = \boxed{454\,km}$

12. You, unwisely, fell asleep in an open field. A zombie who is 16m away, sees you and begins to move towards you. If the zombie moves at a constant speed of 0.80m/s, how much time do you have until he makes it to you?

$t = \frac{d}{s} = \frac{16m}{0.8\frac{m}{s}} = \boxed{20s}$

13. You were able to get up and get away before the zombie made a meal out of your brain, but sadly your friends are leaving you behind. If you run at a constant speed of 1.5m/s and your friends are driving away at 6.0m/s and you accelerate to 0.5m/s^2, how long before you reach your friends car?

$t = \frac{v_f - v_i}{a} = \frac{6.0\frac{m}{s} - 1.5\frac{m}{s}}{0.5\,m/s^2} = \boxed{9s}$

14. If the zombie has a mass of 85kg, what is her weight?

$W = mg = 85kg \times 10\frac{m}{s^2} = \boxed{850\,N}$

15. You're driving down an unfamiliar road and you come upon a stop sign. By the time you see it, it takes you 15s to decelerate -1.2m/s^2, what speed were you traveling when you saw the stop sign?

$v_f - v_i = at = -1.2\frac{m}{s^2} \times 15s = -18\frac{m}{s}$

$\boxed{18\frac{m}{s} \text{ if } v_f = 0\frac{m}{s}}$

Newton's Law Identification – 2.5 pts

16. A team of huskies pulling a sled through the Alaskan wilderness. 2nd
17. Pulling the tablecloth out from under your parents at dinner and their plates remain untouched. 1st
18. A game of Red Rover. 3rd
19. Pushing a large ball made of lead versus a ball made of rubber. 2nd
20. Swinging a baseball bat and connecting with the baseball. 3rd

Name: _____ ID: A

Unit 7 Test - Motion & Forces [Part 2]

Multiple Choice
Identify the choice that best completes the statement or answers the question.

1. 3 m/s north is an example of a(n) ____.
   a. position
   b. acceleration
   c. velocity
   d. speed

2. If the net force acting on a moving object is zero, the object will:
   a. continue at the same speed but change direction.
   b. continue in the same direction but change speed.
   c. slow down and, eventually, stop.
   d. continue in the same direction with no change of speed.

3. In the absence of air, a penny and a feather that are dropped from the same height at the same time will ____.
   a. float
   b. fall at the same rate
   c. fall at different rates
   d. not have momentum

4. The speed you read on a speedometer is ____.
   a. constant speed
   b. average speed
   c. instantaneous speed
   d. velocity

5. The size of the gravitational force between two objects depends on their ____.
   a. speed and direction
   b. masses and the distance between them
   c. inertia
   d. frictional forces

6. If you ride your bicycle down a straight road for 500 m then turn around and ride back, your distance is ____ your displacement.
   a. can't determine
   b. greater than
   c. equal to
   d. less than

7. Which is *not* an example of sliding friction?
   a. taking notes with a pencil
   b. ice skating on a frozen pond
   c. rolling a ball across a desk
   d. pushing a book across a table

8. In the equation $p = m \times v$, the p represents ____.
   a. momentum
   b. friction
   c. inertia
   d. position

9. Motion is a change in ____.
   a. velocity
   b. speed
   c. position
   d. time

10. An object's momentum is determined by the object's
    a. mass and acceleration.
    b. weight and acceleration.
    c. mass and velocity.
    d. weight and velocity.

11. Which is an example of static friction?
    a. pushing a box that is at rest
    b. braking a car going down a hill
    c. pulling a skier behind a boat
    d. driving a car up a hill

12. Speeding up, slowing down, and changing direction is best described as
    a. distance.
    b. velocity.
    c. displacement.
    d. acceleration.

13. If an object is accelerated, all of the following may occur EXCEPT:
    a. a change of direction.
    b. a change of speed.
    c. a change of direction and speed.
    d. it remains motionless.

14. If you ride your bike and begin to brake (slow down), then you start to pedal again causing you to speed up, your acceleration is ____.
    a. first positive, then negative
    b. first negative, then positive
    c. all negative
    d. all positive

15. Inertia varies depending on ____.
    a. mass
    b. motion
    c. force
    d. velocity

16. Whenever a force is exerted, another force occurs that is _____ in size, and _____ in direction.
    a. smaller, same
    b. smaller, opposite
    c. equal, same
    d. equal, opposite

17. For any object, the greater the force that's applied to it, the greater its ____ will be.
    a. inertia
    b. velocity
    c. gravity
    d. acceleration

18. Which object has the greatest inertia?
    a. a beach ball
    b. a tennis ball
    c. a volleyball
    d. a bowling ball

19. The force that resists the motion of objects or surfaces in contact with one another is called ____ force.
    a. net
    b. normal
    c. inertial
    d. frictional

20. Newton's first law of motion is also called the law of ____.
    a. force
    b. inertia
    c. mass
    d. constant velocity

21. A tug-of-war that results in one team pulling the other across the line is an example of
    a. balanced forces.
    b. unbalanced forces.
    c. action forces.
    d. reaction forces.

22. Weight is best described as
    a. what causes an object to fall.
    b. a force solely dependent on an object's mass.
    c. the downward force exerted on an object due to gravity.
    d. an object's resistance to acceleration.

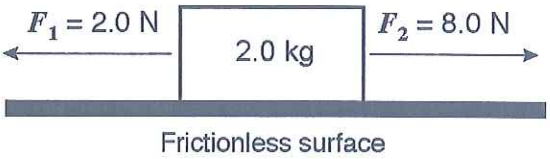
23. A real car moving at 10 km/h has more momentum than a toy car moving at the same speed because the real car ____.
    a. has less mass
    b. has greater forward motion
    c. generates less friction
    d. has greater mass

24. The upward force on an object falling through the air is ____.
    a. inertia
    b. air resistance
    c. momentum
    d. terminal velocity

25. When an object moves in a circular path, it accelerates toward the center of the circle as a result of ____.
    a. frictional force
    b. gravitational force
    c. momentum
    d. centripetal force

26. When two balls collide, the momentum of the balls after the collision is explained by ____.
    a. Newton's third law of motion
    b. the law of conservation of momentum
    c. Newton's second law of motion
    d. Newton's first law of motion

27. Two forces are applied to a 2.0-kilogram block on a frictionless, horizontal surface, as shown in the following diagram:

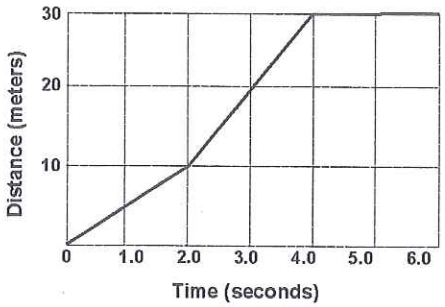


    The net force of the block is:
    a. 6.0 m/sec^2 to the right.
    b. 6.0 m/sec^2 to the left.
    c. 3.0 m/sec^2 to the right.
    d. 3.0 m/sec^2 to the left.

28. When a force is exerted on a box, an equal and opposite force is exerted by the box. These forces are called ____ forces.
    a. gravitational
    b. centripetal
    c. frictional
    d. action-reaction

29. A horizontal line on a velocity/time graph shows ____ acceleration.
    a. positive
    b. negative
    c. zero
    d. changing

30. The graph below represents the motion of a moving vehicle. What is the speed of the vehicle during the time interval from t = 2.0 seconds to t = 4.0 seconds?



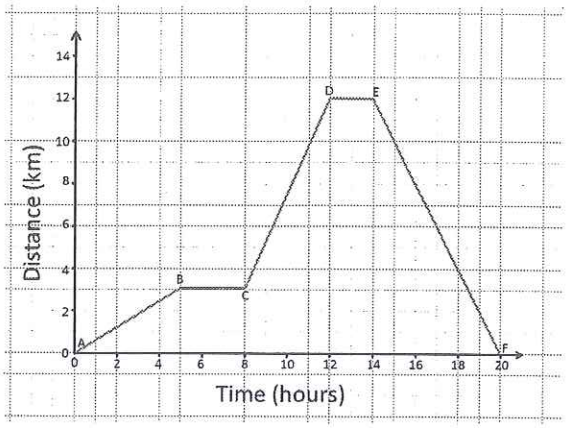
    a. 0.0 m/sec
    b. 5.0 m/sec
    c. 7.5 m/sec
    d. 10. m/sec

31. A merry-go-round horse moves at a constant speed but at a changing ____.
    a. velocity
    b. balanced force
    c. inertia
    d. unbalanced force

32. The tendency of an object to resist any change in its motion is _____.
    a. velocity
    b. acceleration
    c. inertia
    d. displacement

33. A push or pull that is exerted on an object is the _____.
    a. velocity
    b. force
    c. inertia
    d. momentum

Using the graph below, answer the following questions:



34. Which area of the graph shows the highest speed?
    a. A to B
    b. E to F
    c. C to D
    d. D to E

35. Which area of the graph shows zero change in velocity?
    a. A to B
    b. B to C
    c. C to D
    d. E to F