Name _____ Element _____

Physics
Pre-comp diagnostic Answers

Grade 8
2017-2018

Instructions:

THIS TEST IS NOT FOR A GRADE. It is to help you determine what you need to study for the precomps. Just do your best.

Put your name and element at the top of this page

You have all period to complete this assessment. There will be no additional time given beyond this class period.

Calculators may be used on any question on this test.

DO NOT RANDOMLY FILL IN BUBBLES – if you have no idea what the answer is, leave it blank.

Answer the multiple choice questions on the supplied answer sheet.

You may write on this test.

You may write on the answer document.

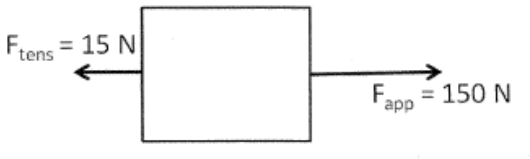
Please use pencil – and make your marks fill the bubbles completely.

1. I know how fast an object is moving. I don't know its direction. Therefore, I know the _____ of the object.
    1. Acceleration
    2. Motion
    3. **Speed**
    4. Velocity
2. Calculate the speed if a distance of 400 m is traveled in 12 seconds.
    1. **33.3 m/s**
    2. 400 m/s
    3. 412 m/s
    4. 4800 m/s
3. What needs to be true for a velocity to be constant?
    1. The object cannot change direction
    2. The speed needs to stay the same.
    3. **Both a and b**
    4. Neither a nor b
4. If you plot velocity vs. time, what does the slope of the graph represent?
    1. Speed
    2. Velocity
    3. **Acceleration**
    4. Displacement
5. If you plot velocity vs. time, what does the area under the curve represent?
    1. Speed
    2. Velocity
    3. Acceleration
    4. **displacement**
6. Calculate the magnitude of the acceleration of an object that goes from 20 m/s to 32 m/s in 3 seconds.
    1. **4 m/s^2**
    2. 10.67 m/s^2
    3. 12 m/s^2
    4. 17.3 m/s^2
7. Newton's first law states, "An object _____ will stay in motion and an object _____ will stay at rest unless acted on by _____ force." What words go in order in the blanks?
    1. at rest, in motion, an unbalanced
    2. at rest, in motion, a balanced
    3. in motion, at rest, an unbalanced
    4. **in motion, at rest, a net**
8. Which is true:
    1. Mass is how much something weighs.
    2. Mass requires gravity, weight does not.
    3. **Weight requires gravity, mass does not.**
    4. Neither mass nor gravity can change based on position.
9. In Newton's second law of motion, which is true?
    1. **A net force causes an acceleration directly proportional to the force.**
    2. A net force causes an acceleration inversely proportional to the force.
    3. A net force causes a change in mass directly proportional to the force.
    4. A net force causes a change in mass inversely proportional to the force.

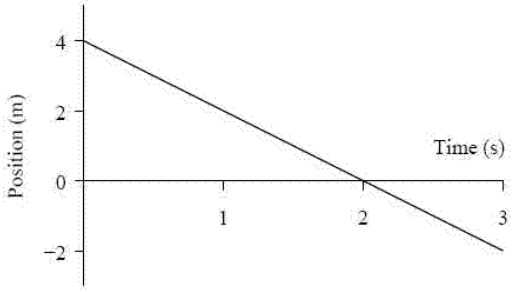
10. How do I write Newton's second law in equation form?
    1. $\vec{a} = \frac{\vec{v_f} - \vec{v_i}}{\Delta t}$
    2. $\overrightarrow{F_{net}} = m\vec{a}$
    3. $\overrightarrow{F_{net}} = \frac{m}{\vec{a}}$
    4. $\vec{p} = m\vec{v}$
11. Which of the following is not a force?
    1. **Inertia**
    2. A push
    3. Tension
    4. Weight
12. If an object is traveling in the negative direction and slowing down, what is true of its acceleration?
    1. **It is positive.**
    2. It is negative.
    3. It is zero.
    4. It depends on its initial velocity.
13. Two children fight over a 5 kg toy. One pulls with 10 N of force to the right, the other pulls with 20 N of force to the left. What is the acceleration of the toy?
    1. **2 m/s^2 left**
    2. 2 m/s^2 right
    3. 6 m/s^2 left
    4. 6 m/s^2 right
14. What is the difference between a vector quantity and a scalar quantity?
    1. A scalar quantity has a direction, a vector quantity does not.
    2. **A vector quantity has a direction, a scalar quantity does not.**
    3. A vector quantity has a magnitude, a scalar quantity does not.
    4. A scalar quantity has a magnitude, a vector quantity does not.
15. When all of the forces on an object are balanced, an object must be…
    1. At rest
    2. **In equilibrium**
    3. Moving
    4. Stationary
16. All the forces acting on an object add up to zero, what are these called?
    1. **Balanced forces**
    2. Normal forces
    3. Tension forces
    4. Unbalanced forces
17. An object is pushed against a surface. The force that acts perpendicularly to that surface is called the…
    1. Applied force
    2. Friction force
    3. **Normal force**
    4. Tension force
18. An object hangs from a rope, there must be a…
    1. Applied force
    2. Friction force
    3. Normal force
    4. **Tension force**

19. Which is not true of the kinetic friction force
    1. It acts opposite the direction of motion
    2. It acts parallel to the surface
    3. It results from two surfaces sliding past each other
    4. **All of the above are true statements about friction**
20. What causes friction?
    1. Gravity
    2. **The fact that no surface is perfectly smooth**
    3. The object's mass
    4. The object's inertia
21. A force of 10 N is applied to a spring that obeys Hooke's law. If the spring extends 0.025 m, what is the spring constant of the spring?
    1. 0.25 N/m
    2. 64000 N/m
    3. 32000 N/m
    4. **400 N/m**
22. A spring that obeys Hooke's law has a spring constant of 40 N/m and is compressed 0.5 meters. What is the Force that the spring applies to the object compressing it?
    1. **20 N**
    2. 40 N
    3. 80 N
    4. It cannot be evaluated without the mass of the object.
23. Using Newton's third law, if the action is: I push the car to the west; what would the reaction be?
    1. **The car pushes me to the east**
    2. The car pushes me to the south
    3. The car rolls west
    4. The car will stay at rest
24. Newton's third law states that for every action there is a reaction force. What is true of this force?
    1. It is equal in direction and opposite in magnitude to the action force.
    2. **It is equal in magnitude and opposite in direction to the action force.**
    3. It is only equal in magnitude to the action force, the direction doesn't matter.
    4. It is only in the opposite force to the action force, the magnitude doesn't matter.
25. If an object has a displacement of zero m, which of the following is true?
    1. It has no velocity *(if average this is true, but can have instantaneous)*
    2. No work is done on it *(if no Net Work then true, however, the friction force actually does do work.)*
    3. It ends up where it started *('ends up' probably infers stopped but in my opinion it should be explicit and say stopped, otherwise could be interpreted as continuing in motion but has ended up at the start at that moment in time. Also each choice here is independent of the others so the phrase "ends up", should really be in the first part of the question before the choices a, b, c & d.)*
    4. **All of the above are true *(If we do not overthink this then probably d is the expected answer.)***
26. How are net force and acceleration related?
    1. **Net force and acceleration are directly proportional.**
    2. Net force and acceleration are inversely proportional.
    3. Net force and acceleration are equal.
    4. Net force and acceleration are related by the inverse square law.

27. An ice skater has a weight of 490 N and is accelerating at 5 m/s^2 to the north, calculate the net force that must be on her for this to be true.
    1. There is no net force on the skater.
    2. **250 N north**
    3. 2450 N north
    4. 490 N north
28. What additional force would be required for the object below to be in equilibrium?



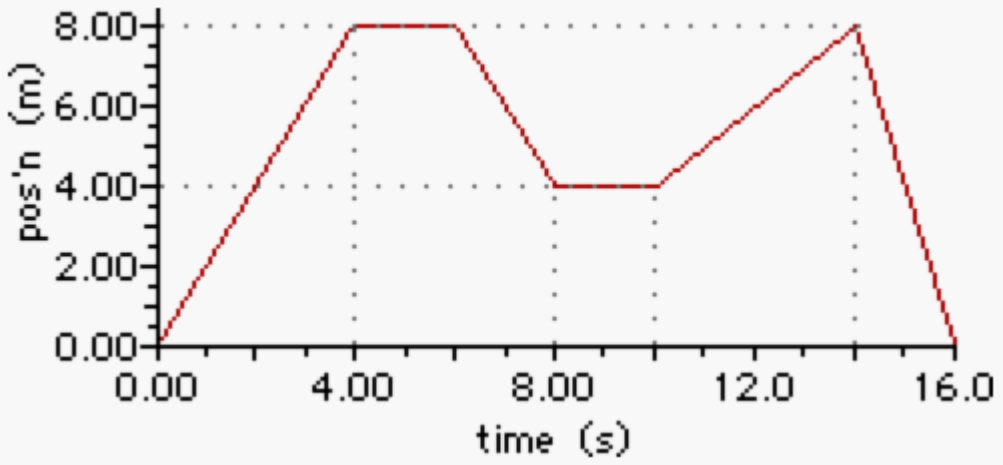
    1. 165 N to the right
    2. 165 N to the left
    3. 135 N to the right
    4. **135 N to the left**
29. Where is the vertical acceleration of a projectile the greatest?
    1. At the highest point of its trajectory.
    2. At the initial position of its trajectory.
    3. At the final position of its trajectory.
    4. **It is always the same at every point on its trajectory.**
30. How much would a 49 kg man weigh on Earth?
    1. **480.2 N**
    2. 5 N
    3. 49 kg
    4. Not enough information given
31. The p vs. t graph for an object moving in a straight line is shown below. What is the instantaneous velocity at t = 2 s?



    1. **– 2 m/s**
    2. ½ m/s
    3. 0 m/s
    4. 2 m/s
32. An object is pushed across the table. The applied force is 20 N to the right. There is a kinetic friction force of 11 N. What is the net force on the object?
    1. 31 N to the right
    2. **9 N to the right**
    3. 9 N to the left
    4. 31 N to the left

33. What happens to the force between two objects if the distance between the masses is doubled?
    1. **It decreases by a factor of 4**
    2. It increases by a factor of 4
    3. It decreases by a factor of 2
    4. It increases by a factor of 2
34. Which of the following scenarios does not describe an acceleration?
    1. A car starting at rest and ending at 110 km/hr.
    2. A car starting at 110 km/hr and ending at 0 km/hr.
    3. **A car driving at a constant speed along a straight road.**
    4. A car driving at a constant speed driving along a curved racetrack.
35. You have a position time plot, where there are meters on the y axis and seconds on the x axis. What physical quantity does the slope represent?
    1. **Velocity**
    2. Position
    3. Acceleration
    4. Time
36. A 1 kg rock is dropped from a 10 m tall bridge to the water below. What is its PEgrav before it is dropped?
    1. 0 J
    2. 20 J
    3. **100 J**
    4. 146 J
37. A 1020 kg helicopter is traveling 100 m above the ground at a velocity of 15 m/s. What is the kinetic energy of the helicopter?
    1. **114750 J**
    2. 5140000 J
    3. 9996000 J
    4. 1114350 J

Questions 38 and 39 use the position time plot below:



38. For the graph above, calculate the area under the curve from 10 second to 14 seconds?
    1. 32 ms
    2. **24 ms**
    3. 1 m/s
    4. 0.57 m/s

39. Calculate the slope of the graph above from 14 to 16 seconds.
    1. 0.5 m/s
    2. -0.5 m/s
    3. 4 m/s
    4. **-4 m/s**
40. Which of the following equations is correct?
    1. $\sin\Theta = \frac{rise}{run}$
    2. $\cos\Theta = \frac{opposite}{adjacent}$
    3. $\mathbf{\cos\Theta = \frac{adjacent}{hypotenuse}}$
    4. $\sin\Theta = \frac{adjacent}{hypotenuse}$
41. An object with a mass of 2kg is dropped from rest from a height of 4 meters above the ground. When it has free-fallen 1 meter its total mechanical energy with respect to the ground is ____.
    1. 8 J
    2. 58.8 J
    3. **78.4 J**
    4. There is not enough information given.
42. A roller coaster car with a mass of 250 kg starts with a velocity of 2 m/s at the top of a 3 m hill. What is the approximate speed of the car at the bottom of the hill?
    1. 0 m/s
    2. 2 m/s
    3. **8 m/s**
    4. 64 m/s
43. If a 3 kg RC car starts at rest and the motor does 24 J of positive work, what is the final velocity of the car?
    1. 0 m/s
    2. **4 m/s**
    3. 8 m/s
    4. 16 m/s

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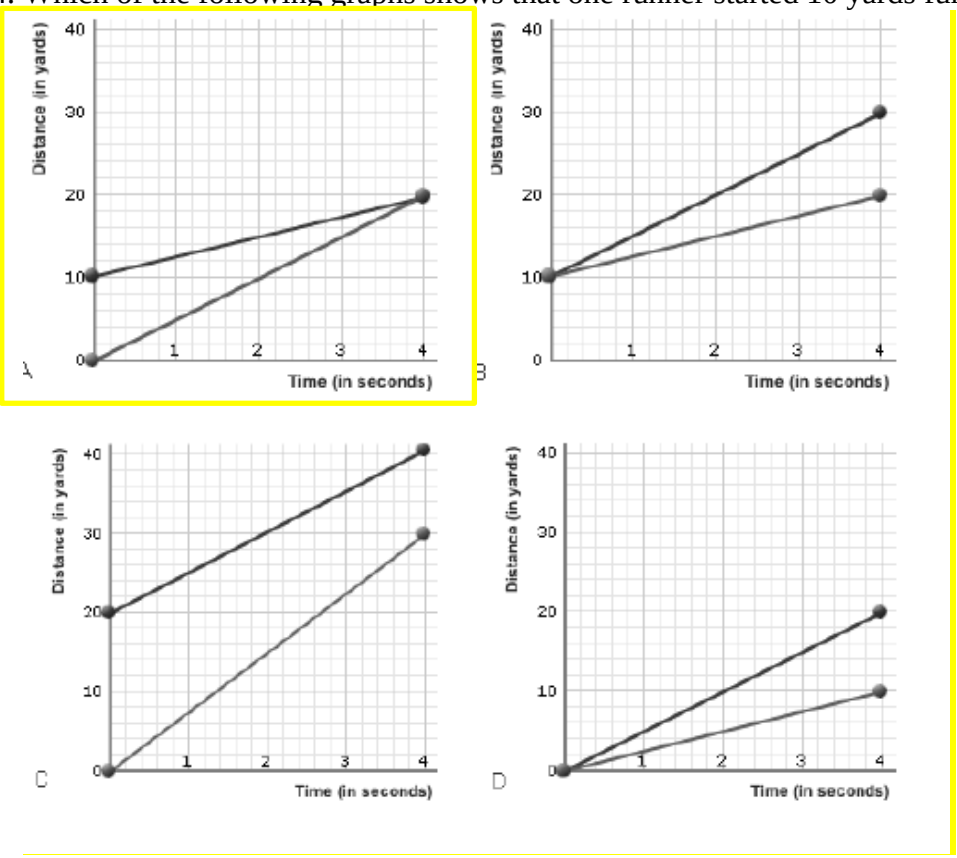
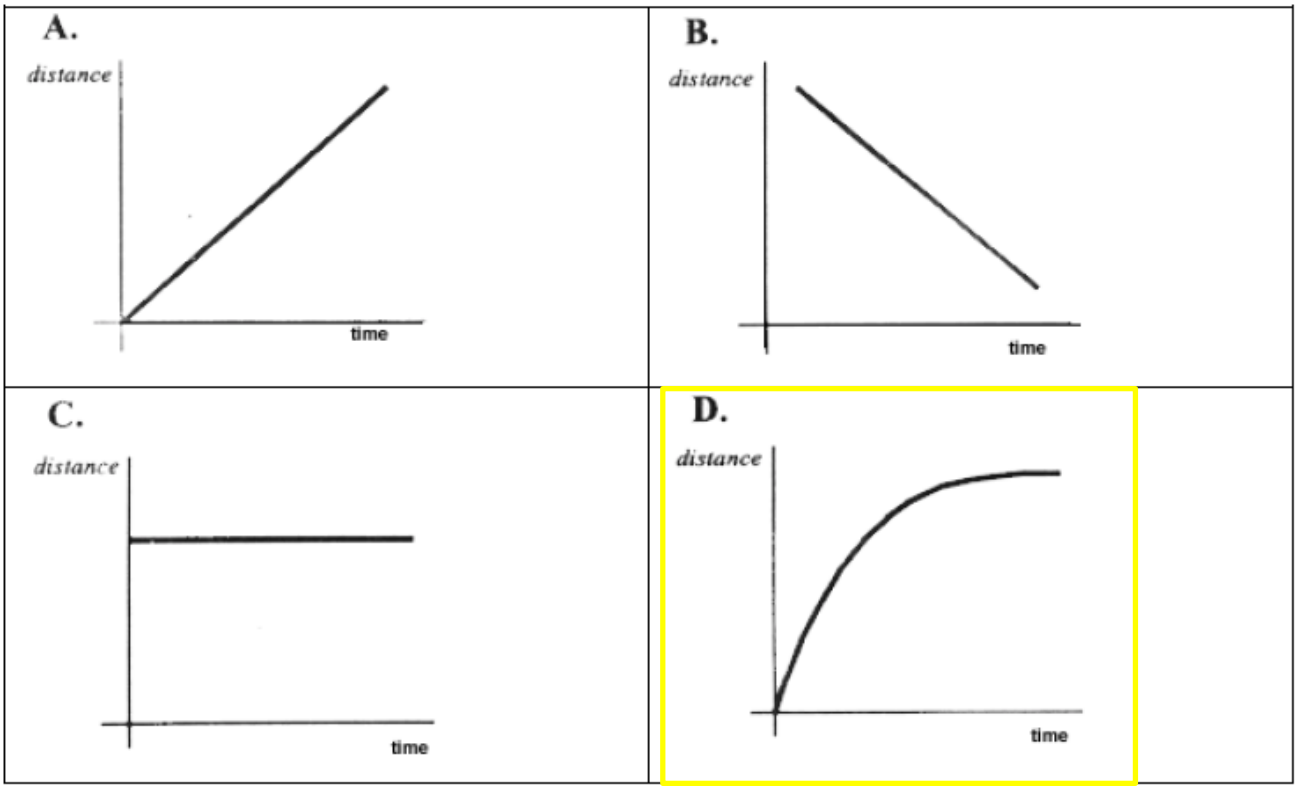
44. Which of the following graphs shows that one runner started 10 yards further ahead of the other?



45. Which of the following graphs shows a car that is slowing down?



46. A pair of graphs are generated for a car that is traveling in the positive direction at a constant speed. Which is a proper description of the graphs?
    1. **The position time graph is a straight line with a positive slope and the velocity time graph is a horizontal line.**
    2. The position time graph is a horizontal flat line and the velocity time graph is a straight line with a positive slope.
    3. The position time graph is an upwards curving line and the velocity time graph is a straight line with a positive slope.
    4. The position time graph is a upwards curving line and the velocity time graph is a horizontal line.
47. How many forces would appear on the free body diagram for a falling object? (Ignore air resistance)
    1. 0
    2. **1**
    3. 2
    4. 4
48. In which of the following situations is the normal force equal to the gravitational force on a book?
    1. A book is at the bottom of a large stack of books.
    2. **A book is being pushed horizontally along the table.**
    3. A book is being held down by an applied force downward.
    4. All of the above