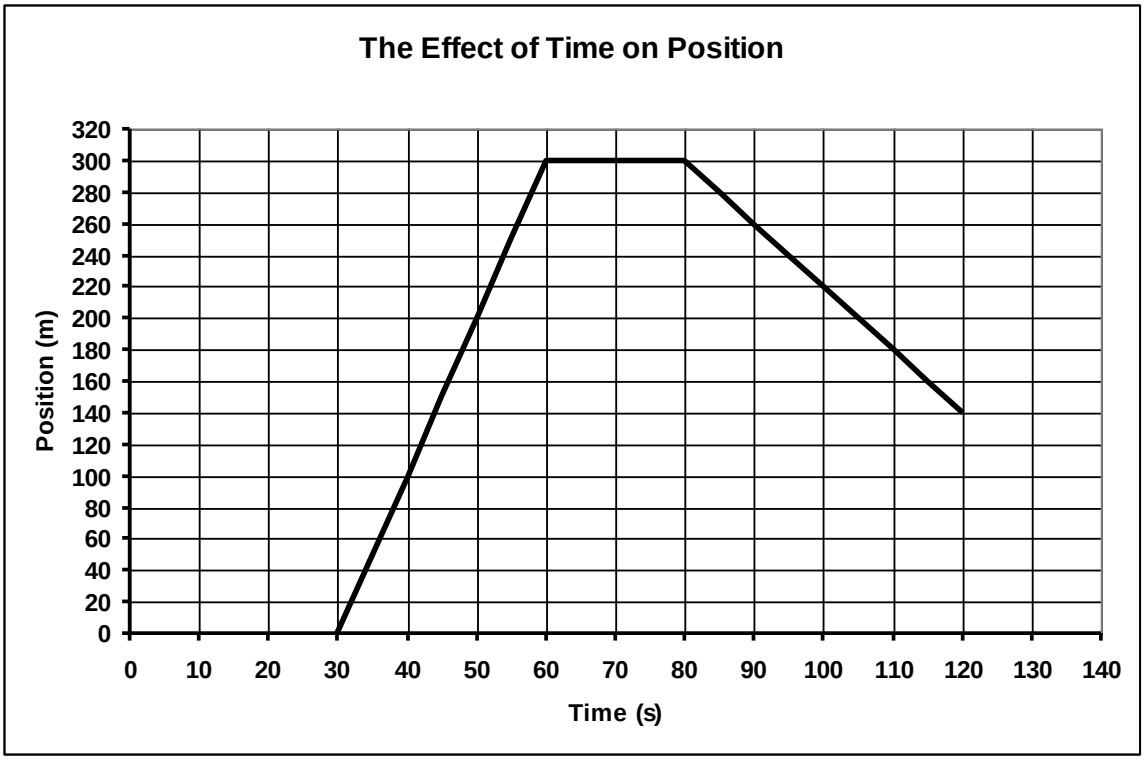
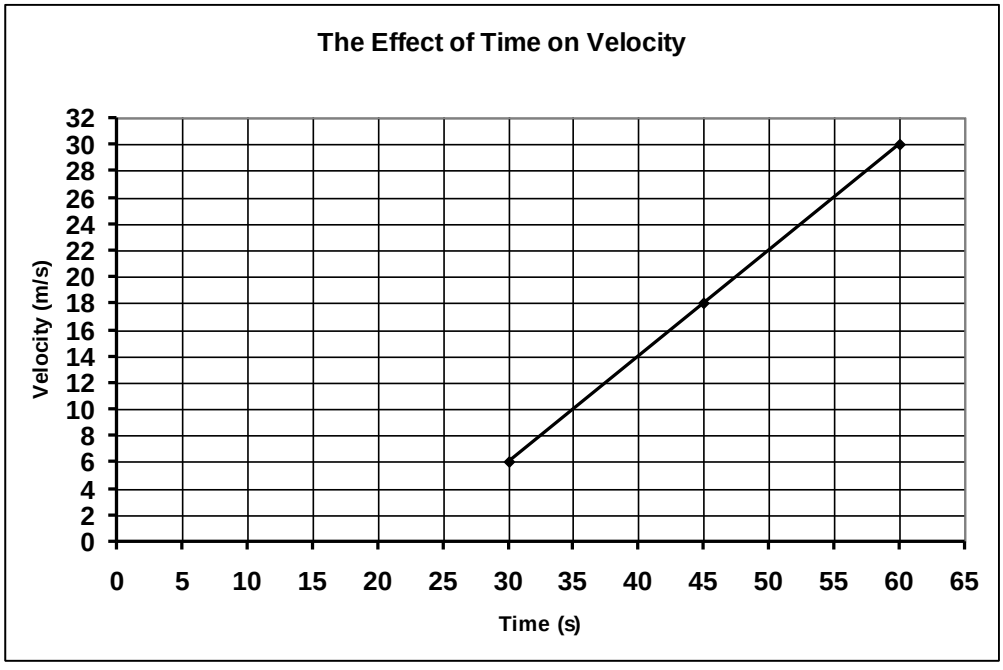
Name _____ 1 2 3 4 5 6 7

Physical Systems Benchmark Exam
Testing Sheet

x-t Graph A



v-t Graph B



Ferguson-Florissant School District

Test Number _____

Physical Systems Benchmark Exam Content

★ Questions 1 – 76 are selected response: Choose the best answer and bubble the corresponding letter on your Scantron.
★ Do not write on this test. Scratch paper is provided.
★ Be sure to write the test number on your Scantron.

Ferguson-Florissant School District

1) Which of the following can be detected by the human eye? [1 point; I.2.A.e]
   a. Visible light waves
   b. Ultraviolet light waves
   c. Infrared light waves
   d. All of the above

2) An electromagnetic wave that has a wavelength of 250 m and is used to transmit data using an antenna for reception is a(n): [1 point; I.2.A.e]
   a. Visible light wave
   b. Infrared light wave
   c. Radio wave
   d. Microwave

3) An electromagnetic wave that is used to look at structures inside the human body, but can be harmful in large amounts is a(n): [1 point; I.2.A.e]
   a. Gamma ray wave
   b. Ultraviolet light wave
   c. X-ray wave
   d. Microwave

4) Which of the following has the highest energy and can cause the most harm to the human body? [1 point; I.2.A.e]
   a. Gamma ray waves
   b. Ultraviolet light waves
   c. Radio waves
   d. Visible light waves

5) Which of the following objects would have the **highest** kinetic energy? [1 point; I.2.B.a]
   a. A bowling ball traveling 5 m/s
   b. A grain of sand traveling 5 m/s
   c. A baseball traveling 5 m/s
   d. A car traveling 5 m/s

6) If the velocity of an object increases, then the object's kinetic energy will: [1 point; I.2.B.a]
   a. Increase
   b. Decrease
   c. Stay the same

7) What is the kinetic energy of a 5 kg sweatshirt traveling down the laundry chute at 2 m/s? [1 point; I.2.B.a]
   a. 2.5 Joules
   b. 5 Joules
   c. 20 Joules
   d. 10 Joules

8) What is the kinetic energy of an 800,000 kg boat moving down the Mississippi at 0.002 m/s? [1 point; I.2.B.a]
   a. 800 Joules
   b. 1.6 Joules
   c. 1600 Joules
   d. 3.2 Joules

9) Which of the following objects would have the **highest** potential energy? [1 point; I.2.B.b]
   a. A baseball sitting on top of a school bus
   b. A bowling ball sitting on top of a school bus
   c. A baseball sitting on top of the St. Louis Arch
   d. A bowling ball sitting on top the of St. Louis Arch

10) If the height of an object relative to the earth's surface is decreased, then the object's potential energy will: [1 point; I.2.B.b]
   a. Increase
   b. Decrease
   c. Stay the same

11) What is the potential energy of a 5 kg purse sitting 0.9 m above the ground on a coffee table? [1 point; I.2.B.b]
   a. 4.5 Joules
   b. 4.2 Joules
   c. 44.1 Joules
   d. 44.8 Joules

12) What is the potential energy of an 11 N book sitting 1.5 m above the ground on a desk? [1 point; I.2.B.b]
   a. 161.9 Joules
   b. 161.7 Joules
   c. 16.3 Joules
   d. 16.5 Joules

13) A book sitting on the surface of the earth has: [1 point; I.2.B.c]
   a. Potential energy
   b. Kinetic energy
   c. No energy
   d. Both a and b are correct

14) A Cross Country Athlete running from McCluer to McCluer South Berkley has: [1 point; I.2.B.c]
   a. Potential energy
   b. Kinetic energy
   c. No energy
   d. Both a and b are correct

15) A child swinging through the air on a swing has: [1 point; I.2.B.c]
   a. Potential energy
   b. Kinetic energy
   c. No energy
   d. Both a and b are correct

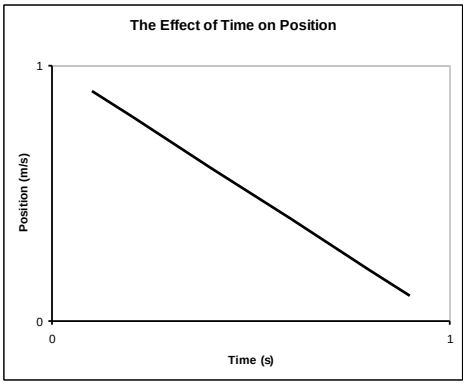
16) A bird sitting in a tree has: [1 point; I.2.B.c]
   a. Potential energy
   b. Kinetic energy
   c. No energy
   d. Both a and b are correct

Use *x-t* Graph A on your Testing Handout to answer Question 17 & 18.

17) On ***x-t* Graph A**, calculate the velocity of the object during Δt_1 (30s to 60s). [1 point; II.1.A.a; II.1.B.a]
   a. -0.1 m/s
   b. 0.1 m/s
   c. -10 m/s
   d. 10 m/s

18) On ***x-t* Graph A**, during which time segment(s) was the object not moving? [1 point; II.1.A.a; II.1.B.a]
   a. Δt_1 (30s to 60s)
   b. Δt_2 (60s to 80s)
   c. Δt_3 (80s to 120s)
   d. Δt_1 & Δt_3 (30s to 60s and 80s to 120s)

19) If the position of an object is positive and the object is moving towards the origin, then what is the sign of the object's velocity? [1 point; II.1.A.a; II.1.B.a]
   a. Towards the origin
   b. Away form the origin
   c. Positive
   d. Negative



Use *v-t* Graph B on your Testing Handout to answer Question 20.

20) On ***v-t* Graph B**, calculate the acceleration of the object. [1 point; II.1.A.a; II.1.B.a]
   a. 1.2 m/s^2
   b. -1.2 m/s^2
   c. 0.8 m/s^2
   d. -0.8 m/s^2

21) Which of the following would have the **greatest** momentum? [1 point; II.1.C.a]
   a. A jumbo-jet that is sitting still at a gate at Chicago's O'Hare Airport while people board
   b. A car parked in the student parking lot at McCluer North High School
   c. A soccer ball left sitting on the playground blacktop at Parker Road Elementary School after recess
   d. A grain of sand blowing in the wind on a beach in Florida

22) Which of the following would have the **least** momentum? [1 point; II.1.C.a]
   a. A soccer ball traveling at 10 m/s
   b. A soccer ball traveling at 2 m/s
   c. A soccer ball at rest
   d. A soccer ball traveling at 1 m/s

23) Which of the following would have the **greatest** momentum? [1 point; II.1.C.a]
   a. A train traveling at a velocity of 5 m/s
   b. A mosquito flying with a velocity of 5 m/s
   c. A skateboard traveling at a velocity of 5 m/s
   d. A squirrel traveling with a velocity of 5 m/s

24) Which of the following has a momentum of zero? [1 point; II.1.C.a]
   a. A ladybug flying at 0.0001 m/s
   b. A semi truck parked in a dock while goods are loaded into the trailer
   c. A leaf blowing around in the wind
   d. A drop of water running down the side of a glass

25) A red train traveling east at 55 m/s collides with a blue train traveling west at 55 m/s. The net momentum after the collision: [1 point; II.1.C.b]
   a. Is zero
   b. Is less than before the collision
   c. Is more than before the collision
   d. Is the same as before the collision

26) A red train traveling north at 100 m/s collides with a blue train traveling north at 25 m/s. The net momentum after the collision: [1 point; II.1.C.b]
   a. Is zero
   b. Is less than before the collision
   c. Is more than before the collision
   d. Is the same as before the collision

27) A red train traveling south at 40 m/s collides with a blue train at rest. The net momentum after the collision: [1 point; II.1.C.b]
   a. Is zero
   b. Is less than before the collision
   c. Is more than before the collision
   d. Is the same as before the collision

28) After a collision, the net momentum in a system is 500 kgm/s. What was the net momentum of the system before the collision? [1 point; II.1.C.b]
   a. 0 kgm/s
   b. 500 kgm/s
   c. 1000 kgm/s
   d. Not enough information given

Use the picture of the man and the shopping cart to answer questions 29 – 32.

29) What force is being identified by arrow number 1? [1 point; II.2.A.a]
   a. Tension
   b. Gravity
   c. Normal
   d. Push/Pull
   e. Friction

30) What force is being identified by arrow number 2? [1 point; II.2.A.a]
   a. Tension
   b. Gravity
   c. Normal
   d. Push/Pull
   e. Friction

31) What force is being identified by arrow number 3? [1 point; II.2.A.a]
   a. Tension
   b. Gravity
   c. Normal
   d. Push/Pull
   e. Friction

32) What force is being identified by arrow number 4? [1 point; II.2.A.a]
   a. Tension
   b. Gravity
   c. Normal
   d. Push/Pull
   e. Friction

33) If Alyssa's weight is higher on the sun than on earth, then you would expect her mass on the sun to be_____ on the earth. [1 point; II.2.B.c]
   a. Dependent on her location
   b. Greater than
   c. Less than
   d. The same as

34) The cell phone has a mass of 1.3 kg on earth, what is its weight on earth? [1 point; II.2.B.c]
   a. 0.13 kg
   b. 0.13 N
   c. 12.74 kg
   d. 12.74 N

35) The car exerts a force of 103,000 N on the parking lot, what is the mass of the car? [1 point; II.2.B.c]
   a. 103,000 N
   b. 10,510.20 kg
   c. 1,009,400 kg
   d. 1,009,400 N

36) The rock has a mass of 0.8 kg on the moon, what is its mass on earth? [1 point; II.2.B.c]
   a. 0.5 kg
   b. 1.28 N
   c. 7.84 N
   d. 0.8 kg

37) What is the relationship between electricity and magnets? [1 point; II.2.C.a]
   a. The movement of a magnet creates an electric current but an electric current does not create a magnetic field
   b. The movement of a magnet does not create an electric current but an electric current can create a magnetic field
   c. The movement of a magnet creates an electric current and an electric current can create a magnetic field
   d. The movement of a magnet does not create an electric current and an electric current does not create a magnetic field

38) If there is a wire with an electric current running through it, how could a magnet be used to increase the electric current: [1 point; II.2.C.a]
   a. Place a stationary magnet 1 mm away from the wire
   b. Move the magnet next to the wire
   c. Place a stationary magnet 1 km away from the wire
   d. A magnet can not be used to increase an electric current

39) If the electric current is decreased, then: [1 point; II.2.C.a]
   a. The magnetic field will increase
   b. The magnetic field will decrease
   c. The magnetic field will not be affected

40) If a magnetic field increases, then: [1 point; II.2.C.a]
   a. The electric current will increase
   b. The electric current will decrease
   c. The electric current will not be affected

41) A proton and a proton will: [1 point; II.2.C.b]
   a. Attract each other
   b. Repel each other
   c. Have no effect on each other

42) A proton and an electron will: [1 point; II.2.C.b]
   a. Attract each other
   b. Repel each other
   c. Have no effect on each other

43) A electron and an electron will: [1 point; II.2.C.b]
   a. Attract each other
   b. Repel each other
   c. Have no effect on each other

44) The north pole of one magnet and the north pole of another magnet will: [1 point; II.2.C.b]
   a. Attract each other
   b. Repel each other
   c. Have no effect on each other

45) Inertia is: [1 point; II.2.D.a]
   a. The tendency of all objects to resist a change in motion
   b. The tendency of all objects to change its mass so it can move
   c. The tendency of all objects to change direction when an external non-zero net force is **not** present
   d. The tendency of all objects to be at rest

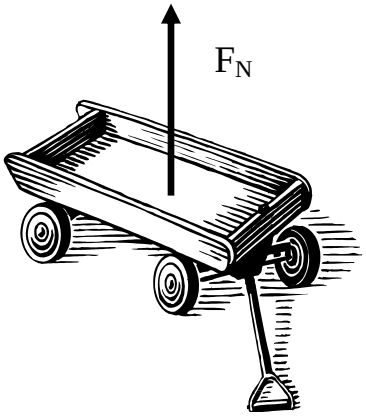
46) If the $\Sigma F = 0$ on an object in motion then the path and velocity of the object would be: [1 point; II.2.D.a;]
   a. Path: straight
      Velocity: not constant
   b. Path: straight
      Velocity: constant
   c. Path: curved
      Velocity: not constant
   d. Path: curved
      Velocity: constant

47) What is the sum of all forces on an object that is moving with a constant velocity? [1 point; II.2.D.a]
   a. $\Sigma F = 0$
   b. $\Sigma F \neq 0$
   c. Both a and b are correct

48) What is the sum of all forces on an object that is accelerating? [1 point; II.2.D.a]

a. $\Sigma F = 0$
b. $\Sigma F \neq 0$
c. Both a and b are correct

49) Look at the picture and identify the opposite force acting on the wagon that would make the sum of all forces equal zero. [1 point; II.2.D.b]



a. F_P →

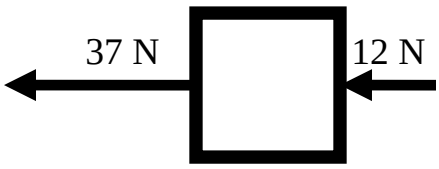
b. F_f ←

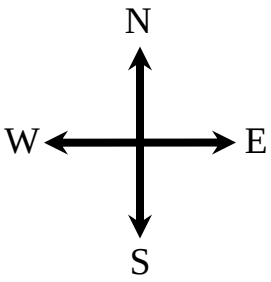
c. ↓ F_g

d. ↓ F_g

50) What is the sum of all forces on the following object? [1 point; II.2.D.b]

a. 49 N, West
b. 49 N, Left
c. 25 N, West
d. 25 N, Left

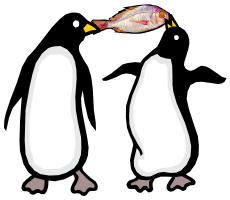




51) Sydney and Adelaide were both on the same branch of a eucalyptus tree. Sydney was pushing down with a force of 65.2 N and Adelaide was pulling down with a force of 79.6 N. What is the sum of all forces? [1 point; II.2.D.b]

a. 144.8 N, down
b. 14.4 N, down
c. 17.02, down
d. 208.22 N, down

52) Ross and Weddell were fighting over a fish. Ross was pulling to the west with a force of 17.3 N and Weddell was pulling to the east with a force of 22.8 N. What is the sum of all forces? [1 point; II.2.D.b]



a. 5.5 N, west
b. 5.5 N, east
c. 6 N, east
d. 28.6 N, west and east

53) If mass remains constant and net force increases, then: [1 point; II.2.D.c]
a. Acceleration must decrease
b. Acceleration must increase
c. Acceleration must remain constant

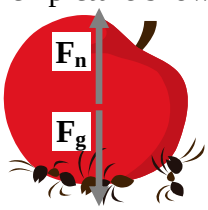
54) Melvin exerted a net force of 27 N which caused the baseball to accelerate at 132 m/s^2. What is the mass of the baseball? [1 point; II.2.D.c]
a. 0.2 kg
b. 3564 kg
c. 48.0 kg
d. 4.9 kg

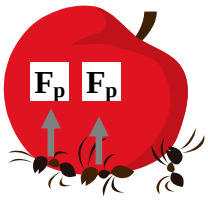
55) At what rate would a 1.2 kg soccer ball accelerate if Miranda kicked it with a 74.5 N net force? [1 point; II.2.D.c]
a. 62.1 m/s^2
b. 89.4 m/s^2
c. 0.016 m/s^2
d. 9.12 m/s^2

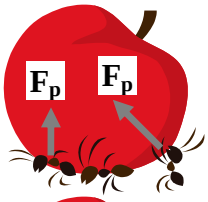
56) Gabrielle pushed a 17 kg box and it accelerated at a rate of 1.2 m/s^2. What is the magnitude of the net force Gabrielle exerted on the box? [1 point; II.2.D.c]
a. 14.167 N
b. 2.08 N
c. 20.4 N
d. 0.07 N

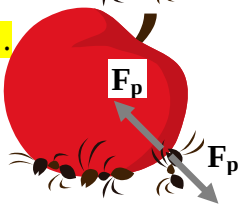
57) Which of the following is an example of an action/reaction pair? [1 point; II.2.D.e]
a. Gravitational force acts on a penny with a force of 0.0389 N down and normal force acts on the same penny with a force of 0.0389 N up.
b. Courtney's hand pulls on the handle of a shopping bag with a force of 23 N up and the shopping bag handle pulls on Courtney's hand with a force of 23 N down.
c. Terrence pushes on a vacuum with a force of 38 N to the East and the vacuum pushes on down on the carpet with a force of 36 N.
d. Brenna pushes on a desk with a force of 56 N to the North and Joi pushes on the same desk with a force of 56 N to the South.

58) Which picture shows an action/reaction pair? [1 point; II.2.D.e]

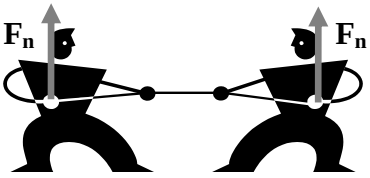
a. 

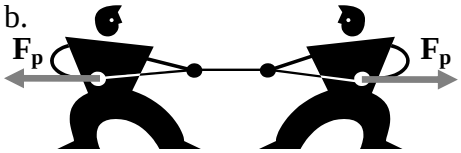
b. 

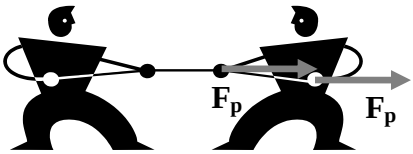
c. 

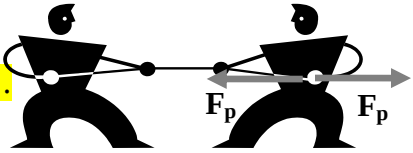
d. 

59) Which picture shows an action/reaction pair? [1 point; II.2.D.e]

a. 

b. 

c. 

d. 

60) A bee flies into an airplane. Which of the following statements is true: [1 point; II.2.D.e]
   a. The airplane hit the bee with a greater force than the bee hit the airplane
   b. The airplane hit the bee with a smaller force than the bee hit the airplane
   c. The airplane hit the bee with the same force that the bee hit the airplane
   d. The bee did not exert a force on the airplane because it was so small

61) Chrissy exerted 200 N of force to move the soccer goal from the South end of the field to the North end of the field, a distance of 30 m. How much work did Chrissy do? [1 point; II.2.F.a]
   a. 6000 Joules
   b. 0 Joules
   c. 6.67 Joules
   d. 230 Joules

62) Jarren used 100 N of force to hold a barbell 1 m off of the ground. How much work did Jarren do? [1 point; II.2.F.a]
   a. 0 Joules
   b. 100 Joules
   c. 0.01 Joules
   d. 101 Joules

63) Lori moved the groceries 30 m using 5 N of force. How much work did Lori do? [1 point; II.2.F.a]
   a. 0 Joules
   b. 6 Joules
   c. 80 Joules
   d. 150 Joules

64) If distance remains constant and force increases, then: [1 point; II.2.F.a]
   a. Work will increase
   b. Work will decrease
   c. Work will remain the same

65) How much power will it take for Miche-Ala to do 900 Joules of work moving her book bag from the annex to the cafeteria if it takes her 300 s? [1 point; II.2.F.c]
   a. 270,000 Watts
   b. 1,200 Watts
   c. 3 Watts
   d. 0 Watts

66) How much power will it take for Joe to do 800 Joules of work moving the programs for the play from the Activities Center to the Theater if he moves them in 100 s? [1 point; II.2.F.c]
   a. 0 Watts
   b. 8 Watts
   c. 900 Watts
   d. 80,000 Watts

67) If work remains constant and time increases then: [1 point; II.2.F.c]
   a. Power will not change
   b. Power will increase
   c. Power will decrease

68) In which of the following is the **greatest** amount of power being used? [1 point; II.2.F.c]
   a. Dani moving her book bag, doing 100 Joules of work in 20 s
   b. Tyler moving a refrigerator, doing 2,500 Joules of work in 25 s
   c. Ariel moving a refrigerator, doing 2,500 Joules of work in 15 s
   d. Freddie hanging from the pull-up bar, doing 0 Joules of work for 90 s

69) If time remains constant and work decreases then: [1 point; II.2.F.d]
   a. Power will not change
   b. Power will increase
   c. Power will decrease

70) If time remains constant and work doubles then: [1 point; II.2.F.d]
   a. Power will not change
   b. Power will double
   c. Power will be cut in half
   d. Power will increase by 4 times

71) How much power will Reina need to move 452 N of newspapers a distance of 34 m from the loading dock to the library if the newspapers have to be delivered in 200 s? [1 point; II.2.F.d]
   a. 76.84 Watts
   b. 0.067 Watts
   c. 2.26 Watts
   d. 2,658.8 Watts

72) How much power will Manfret need to move his 50 N book bag from the office to science class, a distance of 48 m, if he needs to be there before the hall sweep ends in 38 s? [1 point; II.2.F.d]
   a. 91,200 Watts
   b. 63.16 Watts
   c. 39.58 Watts
   d. 0.027 Watts

73) Which of the following statements is part of the Big Bang Theory? [1 point; VI.1.A.a]
   a. The universe is expanding and planets and stars are moving farther away from each other
   b. The universe is collapsing and planets and stars are moving closer to each other
   c. The universe is not changing
   d. The universe will eventually explode

74) Which of the following is **not** a planet in our solar system: [1 point; VI.1.A.a]
   a. Earth
   b. Sun
   c. Jupiter
   d. Mars
   e. Both a and b are correct

75) Our solar system is one of several solar systems orbiting the center of which of the following galaxies? [1 point; VI.1.A.a]
   a. Large Magellanic Cloud Galaxy
   b. Starburst Galaxy
   c. Andromeda Galaxy
   d. Milky-Way Galaxy

76) The contents of the entire universe all orbit around: [1 point; VI.1.A.a]
   a. The Sun
   b. The Earth
   c. A common center of gravity
   d. The edge of the universe

Physical Systems Benchmark Exam Performance Event

Name_____

1st 2nd 3rd 4th 5th 6th 7th

Ferguson-Florissant School District

Use the following prompt to answer questions 77 – 82

Scientists wondered about the effect of the weight of a laundry basket on the force needed to pull the basket 5 meters over a carpet surface.

77) Identify the independent variable: [1 point; VII.1.A.b] Weight

78) Identify the dependent variable: [1 point; VII.1.A.b] Force

79) Write the research question the scientists are testing. [1 point; VII.1.A.a]

What is the effect of weight on force?

80) Write a hypothesis for the experiment. [1 point; VII.1.A.a]

If weight increased then force will increase.

Experimental Design:

Scientists loaded a laundry basket with varying weights of clothes. Then, they measured the horizontal force required to drag the basket across a carpet floor. They did 3 trials for each weight.

The scientists collected the following data:

For the10 lb basket, the trials measured the following forces:

Trial 1 required 15 N, Trial 2 required 14 N, Trial 3 required 12 N

For the 25 lb basket, the trials measured the following forces:

Trial 1 required 42 N, Trial 2 required 35 N, Trial 3 required 39 N

For the 40 lb basket, the trials measured the following forces:

Trial 1 required 58 N, Trial 2 required 51 N, Trial 3 required 54 N

For the 65 lb basket, the trials measured the following forces:

Trial 1 required 75 N, Trial 2 required 77 N, Trial 3 required 74 N

For the 90 lb basket, the trials measured the following forces:

Trial 1 required 110 N, Trial 2 required 101 N, Trial 3 required 108 N

81) Construct a data table for the information the scientists collected. [3 points; VII.1.D.a] Include an average column. [1 point; VII.1.B.e]

The Effect of Weight on Force

Weight (lb)	Force (N)			
	Trial 1	Trial 2	Trial 3	Average
10	15	14	12	13.7
25	42	35	39	38.7
40	58	51	54	54.3
65	75	77	74	75.3
90	110	101	108	106.3

Construct a graph of the average force for each weight. [4 points; VII.1.D.a]

Be sure to provide:

- an appropriate title
- labeled axes with the appropriate units
- appropriate number scales
- correctly plotted data