**Name:** _____   **Date:** _____   **Period:** _____

Select the best answer, writing the capital letter in the space provided

_____ 1) Which of the following is a vector quantity?
    a. Temperature   b. Velocity   c. Mass   d. Distance

_____ 2) A bicycle wheel has frequency 876Hz. How long does it take to complete three rotations?
    a. 3.00s   b. 2630s   c. 1.14×10^{-3} s   d. 3.42×10^{-3} s

_____ 3) Determine the final velocity of a car that accelerates uniformly for 6.42s at $1.35 m/s^2$ from 7.53m/s.
    a. 1.14m/s   b. 16.2m/s   c. 7.53m/s   d. 8.67m/s

_____ 4) Find the initial velocity of a block that comes to a stop in 3.96m decelerating at $7.14 m/s^2$.
    a. 28.3m/s   b. 5.32m/s   c. 7.52m/s   d. 56.5m/s

_____ 5) How long does it take an egg being dropped out a window to fall 24.0m?
    a. 2.21s   b. 9.80s   c. 21.7s   d. 2.45s

_____ 6) When an object is thrown upwards from the surface of the Earth, it experiences an acceleration of
    a. $-9.80 m/s^2$ b. $9.80 m/s^2$ c. $6.67 \times 10^{-11} m/s^2$ d. $0 m/s^2$

_____ 7) A boat accelerates from rest to 64.0km/h in 31.0s. What distance is covered?
    a. 276m   b. 158m   c. 17.8m   d. 0.573m

_____ 8) A truck drives horizontally off a 285m high cliff at 7.30m/s. How far from the base of the cliff does it land?
    a. 7.63m   b. 55.7m   c. 39.0m   d. 39.4m

_____ 9) A projectile is launched at 15.0m/s directed 60.0° above the horizontal from a 243m hill. What is the range?
    a. 110.m   b. 8.49m   c. 127m   d. 63.7m

_____ 10) What is the apparent weight of a 45.2kg person in an elevator accelerating upwards at $3.96 m/s^2$?
    a. 11.4N   b. 622N   c. 179N   d. 443N

Use the position-time graph below to answer questions 11-12
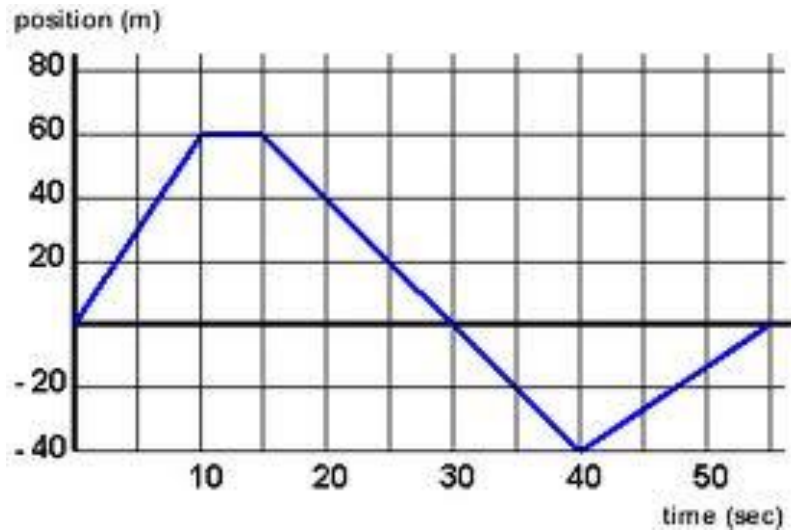
_____ **11)** Between which times is the object stationary?
      a. 0s-10s   b. 15s-40s   c. 10s-15s   d. 40s-55s

_____ **12)** At what time is the object moving the fastest?
      a. 0s-10s   b. 15s-40s   c. 10s-15s   d. 40s-55s

Use the velocity-time graph below to answer questions 13-14
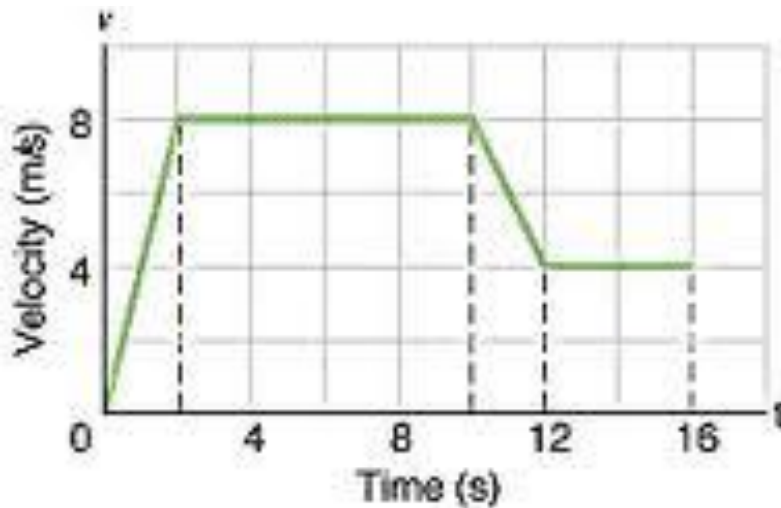
_____ **13)** Calculate the displacement between 4s-12s.
      a. 60m   b. 56m   c. 0m   d. 48m

_____ **14)** At what time does the object change direction?
      a. 0s-2s   b. 2s-10s   c. 10s-12s   d. Never

_____ **15)** What is the maximum force you can pull on a 4.94kg block before it starts to move on a surface that has a coefficient of friction 0.565?

a. 2.79N   b. 48.4N   c. 85.7N   d. 27.4N

_____ **16)** A 5.19kg mass and a 7.35kg mass are connected over a frictionless pulley. Calculate the tension in the string.

a. 59.6N   b. 21.2N   c. 8.77N   d. 72.0N

_____ **17)** A 432g block is hung on a spring with constant 15.0N/m. How much does it stretch from the rest position?

a. 34.7cm   b. 63.5cm   c. 3.54cm   d. 28.2cm

_____ **18)** A 3450kg object is placed on a 19.0° ramp with friction coefficient 0.200. What is the acceleration?

a. $2.79m/s^2$ b. $8.09m/s^2$ c. $1.34m/s^2$ d. $6.18m/s^2$

_____ **19)** What is the gravitational force between the Earth ($m = 5.98 \times 10^{24}$ kg; r = 6380km) and a 2.80kg textbook at its surface?

a. 2.74×10^7 N   b. 1.75×10^{11} N   c. 27.4N   d. 1.75×10^8 N

_____ **20)** What is the gravitational field strength at the surface of a planet with mass 6.02×10^{23} kg and radius 3570km?

a. 3.15×10^6 N/kg   b. 3.15N/kg   c. 4.02×10^{13} N/kg   d. 1.12×10^7 N/kg

_____ **21)** A 2.10×10^3 kg car has a velocity of 1.45m/s. How fast must a 4.82kg bowling ball be thrown so that it has the same momentum as the car?

a. 632m/s   b. 3050m/s   c. 1.45m/s   d. 6.99m/s

_____ **22)** What is the impulse of a 2.88g hummingbird that flies from 1.00m/s to 12.3m/s?

a. 32.5kgm/s   b. 35.4kgm/s   c. 0.0325kgm/s   d. 0.234kgm/s

_____ **23)** A pitcher throws a 258g ball at 91.0km/h. If the ball is hit backwards at 37.0km/h and the contact time is 0.465s, how large is the force on the ball?

a. 19.7N   b. 9.17N   c. 4.27N   d. 71.0N

_____ **24)** A 876kg car travelling northbound at 42.3m/s strikes a 591kg car travelling westbound at 23.4m/s. If the two cars stick together, with what velocity do they move off after the collision?

a. 27.0m/s 69.5° W of N   b. 48.3m/s 61.0° W of N
c. 27.0m/s 69.5° N of W   d. 48.3m/s 61.0° N of W

_____ **25)** What is the velocity of a moving car that is 2280kg and has 3.46×10^5 J of energy?

    a. 303m/s   b. 17.4m/s   c. 12.3m/s   d. 0.0550m/s

_____ **26)** How much work is required to bring a 4.20kg puck moving 51.0km/h to rest?

    a. 5460J   b. 29.8J   c. 421J   d. 843J

_____ **27)** A 264kg lawnmower is pushed horizontally 55.0m with a 813N force directed 78.0° below the horizontal (that is, along the handle). Calculate the overall work done if the surface has coefficient 0.0123.

    a. 7540J   b. 9.30×10^3 J   c. 44700J   d. 7010J

_____ **28)** A 2.80m long pendulum is drawn back 55.0° from the vertical. What is the maximum velocity the mass reaches?

    a. 23.4m/s   b. 4.84m/s   c. 74.9m/s   d. 3.41m/s

_____ **29)** A 735kg rollercoaster is moving 46.0m/s atop the highest peak of 888m. How fast does it move on the next hill 222m above the ground?

    a. 19.3m/s   b. 132m/s   c. 123m/s   d. 16.0m/s

_____ **30)** A 648g mass falls a distance of 5.19m. If it lands with a speed of 7.37m/s, what percent of the energy was lost to air resistance?

    a. 15.4%   b. 46.6%   c. 33.0%   d. 17.6%

_____ **31)** What is the power used in moving a box across a floor 4.35m with a force of 121N if it takes 6.93s to complete the task?

    a. 76.0W   b. 528W   c. 17.5W   d. 0.630W

_____ **32)** A motorcycle accelerates from rest to 80.0km/h. If 4.32×10^5 J of work is applied, what is the mass assuming no energy loss due to friction?

    a. 38900kg   b. 135kg   c. 877kg   d. 1750kg

_____ **33)** How much heat is required to raise 693g of oil from -25.0°C to 50.0°C given the specific heat is 4.15J/gK?

    a. 288kJ   b. 216kJ   c. 144kJ   d. 71.9kJ

_____ **34)** If a wave completes 10.0 cycles in 2.00 seconds and the wave is 3.30m long, what is the speed of the wave?

    a. 33.0m/s   b. 45.5m/s   c. 11.4m/s   d. 16.5m/s

35) A ray passes from air into an unknown substance with incident angle 43.2°. The angle of refraction is measured to be 34.5°. What is the refractive index of the material?

    a. 0.0816   b. 1.25   c. 0.827   d. 1.21

36) Which of the following lenses and mirrors converge light?

I	II	III	IV
convex lens	concave lens	concave mirror	convex mirror

    a. II and IV   b. I   c. I and II   d. I and III

37) What is the critical angle for light in a glass block (n = 1.52) that is immersed in water (n = 1.33)?

    a. 1.14   b. 61.0   c. 11.0   d. 29.0

38) What is the image distance for a light placed 7.35cm from a concave lens with radius of curvature 4.65cm?

    a. 3.40cm   b. -0.430cm   c. -0.566cm   d. -1.77cm

39) A 3.21cm tall object is located 4.56cm from a concave mirror producing an image 9.87cm tall. What is the focal length of the mirror?

    a. 6.76cm   b. 0.148cm   c. -14.0cm   d. 3.07cm

40) An object is placed 24.0cm infront of a convex lens with focal length 15.0cm. What is the magnification?

    a. 40.0   b. -1.67   c. -0.600   d. 0.625