1. A constantly accelerating particle increases its velocity from 10 m/s to 20 m/s in 1 s. What is its average velocity during this time?

(A) 10 m/s

(B) 15 m/s

(C) 20 m/s

(D) 30 m/s

(E) 35 m/s

2. How much time is required for a particle to slow from 50 m/s to 20 m/s over a distance of 70 m if the acceleration is constant?

(A) 1 s

(B) 2 s

(C) 2.3 s

(D) 3 s

(E) 4 s

3. A 5 kg block moving at 5 m/s experiences a net force of 10 N in the direction of its motion. What is the magnitude of its acceleration?

(A) 2 m/s2

(B) 5 m/s2

(C) 10 m/s2

(D) 20 m/s2

(E) 30 m/s2

4. The earth has a radius of approximately 6400 km. If an object could orbit the earth just at its surface, approximately how long would the object take to circle the earth one time?

(A) 400*π* s

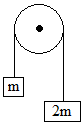
(B) 800*π* s

(C) 1600*π* s

(D) 6400*π* s

(E) 8100*π* s

5. The masses below hang across a massless, frictionless pulley. What is the tension in the rope?



(A) 0.5*mg*

(B) *mg*

(C) 1.33*mg*

(D) 2*mg*

(E) 3*mg*

6. A boy on a toboggan has a combined mass of 40.3 kg. The coefficient of friction is 0.118. If he slides down a slope with an angle of 27.4º, what is his acceleration?

(A) 5.37 m/s2

(B) 4.05 m/s2

(C) 1.37 m/s2

(D) 2.43 m/s2

(E) 3.48 m/s2

7. A 25 kg mass is lowered by a rope. If the velocity of the mass is decreasing at a rate of 5 m/s2, what is the tension in the rope?

(A) 125 N

(B) 250 N

(C) 375 N

(D) 1250 N

(E) 2500 N

8. An LR circuit has a resistance R = 25 Ω, an inductance L = 5.4 mH, and a battery of EMF = 9.0 V. How much energy is stored in the inductance of this circuit when a steady current is achieved?

(A) zero

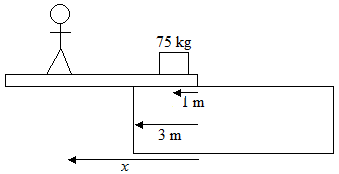
(B) 0.35 J

(C) 0.54 mJ

(D) 0.70 mJ

(E) 0.35 mJ

9. A 10 m board with a mass of 15 kg rests on a large stationary block as shown. A 75 kg box is positioned so that its center of gravity is one meter from the right end of the board. What distance x could a 60 kg woman walk from the right end of the board before it falls?



(A) 4 m

(B) 5 m

(C) 6 m

(D) 8 m

(E) 10 m

10. A 4 kg ball is thrown straight into the air at 6 m/s. How high does it travel?

(A) 1 m

(B) 1.6 m

(C) 1.8 m

(D) 2.0 m

(E) 2.2 m

11. In 50 minutes a forklift lifts twenty-five 60 kg boxes from the floor onto a shelf 2 m high. What is the minimum power of the forklift?

(A) 2 W

(B) 10 W

(C) 100 W

(D) 6000 W

(E) 9000 W

12. A pebble is dropped from the top of a cliff 60 m in height. The kinetic energy of the pebble equals twice its potential energy at a distance of the level is

(A) 70 m

(B) 15 m

(C) 20 m

(D) 12 m

(E) 14 m

13. Which of the following has the greatest kinetic energy?

(A) A 5 kg ball moving at 9 m/s

(B) A 7 kg ball moving at 7 m/s

(C) A 10 kg ball moving at 5 m/s

(D) A 12 kg ball moving at 4 m/s

(E) A 11 kg ball moving at 4 m/s

14. Two 1 kg lumps of clay sit in some mud. A boy picks up one lump of clay and drops it onto the second lump from a height of 1 m. The lumps stick together when they collide. If the second lump is driven into the mud a distance of 1 cm, what is the average force exerted on the mud?

(A) 500 N

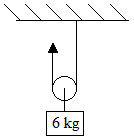
(B) 520 N

(C) 1000 N

(D) 1020 N

(E) 5020 N

15. What minimum force F is required to lift the mass?



(A) 20 N

(B) 30 N

(C) 60 N

(D) 120 N

(E) 150 N

16. If you start with 2.97×1022 atoms of molybdenum-99 (half-life = 65.94 hours), how many atoms will remain after one week?

(A) 8×1021

(B) 1.28×1021

(C) 4.58×1021

(D) 5.08×1021

(E) 7×1021

17. Imagine that a cylinder were constructed with a cross-sectional area of 1 m2 and spanning from the ground to the top of the atmosphere. Now imagine that the air inside that cylinder were weighed and the mass calculated. What would be the mass? (Note: Assume the acceleration of gravity is 10 m/s2.)

(A) 101 kg

(B) 1010 kg

(C) 10100 kg

(D) 101000 kg

(E) 1000 kg

18. Defibrillator machines are used to deliver an electric shock to the human heart in order to resuscitate an otherwise non-beating heart. It is estimated that a current as low as 17 mA through the heart is required to resuscitate. Using 100,000 Ω as the overall resistance, determine the output voltage required of a defibrillating device.

(A) 1 V

(B) 220 V

(C) 380 V

(D) 1700 V

(E) 1800 V

19. A 10 kg object moves from Position #1 to Position #2 close to the surface of the Earth. In so doing, its gravitational potential energy decreases by 200 J. How much work was done by the gravitational force on this object as it moved from Position #1 to Position #2?

(A) -200 J

(B) 20 J

(C) 0

(D) 500 J

(E) 200 J

20. If the frequency of a wave is 200 Hz, and the wavelength is 2 m, what is the velocity of the wave?

(A) 0.05 m/s

(B) 0.5 m/s

(C) 200 m/s

(D) 400 m/s

(E) 500 m/s

21. A mass bouncing on the end of a spring has a period of motion T. If the spring is cut in half, and the mass is set in motion once again, what will be the approximate period of motion?

(A) 0.7*T*

(B) 1.4*T*

(C) 2*T*

(D) 4*T*

(E) 6*T*

22. A negatively charged particle experiences a force F due to an electric field created by a positive point charge when it is placed a distance d from the positive charge. If the negatively charged particle is moved to a distance 2d, which of the following represents the force on the negatively charged particle due to the electric field?

(A) –0.5*F*

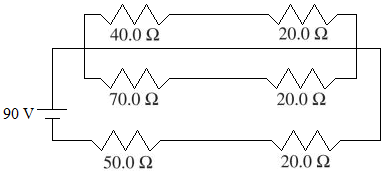
(B) 0.25*F*

(C) 0.5*F*

(D) 2*F*

(E) 4*F*

23. A circuit containing six resistors is connected to a 120 V power supply as shown in the figure below. What is the equivalent resistance of the six resistors?



(A) 100 Ω

(B) 106 Ω

(C) 98 Ω

(D) 110 Ω

(E) 120 Ω

24. Two wires are made of the same conducting material, but Wire #1 has twice the length and four times the radius of Wire #2. If R1 is the resistance of Wire #1, and R2 is the resistance of Wire #2, then which of the following is true?

(A) *R*1 = 2*R*2

(B) *R*1 = 8*R*2

(C) *R*2 = 2*R*1

(D) *R*2 = 8*R*1

(E) *R*2 = *R*1

25. If 1 g of hydrogen is converted into 0.993 g of helium in a thermonuclear reaction the energy released in the reaction is:

(A) 6.3×105 J

(B) 6.3×1011 J

(C) 6.3×1014 J

(D) 6.3×1024 J

(E) 6.3×1025 J

26. A convex lens (refractive index *µ* = 1.57) has power *P*. If it is immersed in a liquid *µ* = 1.33, then its power will become/remain:

(A) *P*

(B) 0.5*P*

(C) 0.25*P*

(D) 4*P*

(E) 2*P*

27. A magnet makes 40 oscillations per minute at a place where horizontal component of earth's magnetic field H is 0.1×10-5 T. At another place, it takes 2.5 s to complete on vibration, the value of earth's horizontal field at that place is:

(A) 2.5×10-6 T

(B) 0.36×10-6 T

(C) 25×10-6 T

(D) 3.6×10-6 T

(E) 0.25×10-6 T

28. A wire of resistance *R* is stretched to double its length, its new resistance will become:

(A) 2*R*

(B) 4*R*

(C) 8*R*

(D) *R*

(E) 16*R*

29. If the current in a coil changes from 0 to 2 A in 0.05 s, the emf induced is 8 V. The self-inductance of the coil is:

(A) 0.1 V

(B) 0.2 V

(C) 0.6 V

(D) 0.12 V

(E) 0.16 V

30. The ratio of intensities of two sound waves is 25:9. What is the ratio of their amplitudes?

(A) 16:9

(B) 9:16

(C) 3:5

(D) 5:3

(E) 1:1