1. A particle moves from position *A* to position *B* and back in 2 seconds. Its average velocity during the trip is:



(A) 0 m/s

(B) 5 m/s

(C) 10 m/s

(D) 20 m/s

(E) 25 m/s

2. A particle initially traveling at 40 m/s slows to 10 m/s over a distance of 75 m. If the acceleration is constant, what is the average speed of the particle?

(A) 25 m/s

(B) 30 m/s

(C) 50 m/s

(D) 90 m/s

(E) 100 m/s

3. A 5 kg block at rest experiences a net force of 10 N. 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, how fast would it have to travel?

(A) 8 km/s

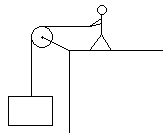
(B) 16 km/s

(C) 80 km/s

(D) 320 km/s

(E) 400 km/s

5. A 50 kg woman dangles a 50 kg mass from the end of a rope. If she stands on a frictionless surface and hangs the mass over a cliff with a pulley as shown, the tension in the rope will be:



(A) 0 N

(B) 250 N

(C) 500 N

(D) 1000 N

(E) 2000 N

6. A boy on a toboggan has a combined mass of 40.7 kg. Friction is negligible. If he slides down a slope with an angle of 24.4º, 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) 3.39 m/s2

7. A 10 kg mass hangs from a rope. A force is applied to the rope so that the mass is accelerated upward at 2 m/s2. What is the tension in the rope?

(A) 80 N

(B) 100 N

(C) 120 N

(D) 200 N

(E) 240 N

8. Two lenses of focal lengths +25 cm and -20 cm are placed in contact, the combined power of lens will be:

(A) -1 D

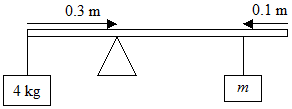
(B) +1 D

(C) +0.5 D

(D) -0.5 D

(E) 1.5 D

9. A one meter board with a mass of 3 kg sits on the point of a block. Blocks are hung from the board as shown. If the board is to be balanced level to the ground, what must be the mass of the block hanging from the right side?



(A) 1 kg

(B) 2 kg

(C) 3 kg

(D) 4 kg

(E) 5 kg

10. A ball with mass m is dropped from a height h. How much kinetic energy does it have just before it hits the ground?

(A) 0.5mg/h2

(B) 0.5mg2

(C) mgh

(D) gh

(E) *g*

11. In 0.5 s, a hammer drives a 30 cm nail into a piece of wood. If the frictional force between the nail and the wood is 200 N, how much power is dissipated by the friction?

(A) 30 W

(B) 60 W

(C) 120 W

(D) 600 W

(E) 900 W

12. A carton is pulled along the ground for a distance of 8 m. If the average frictional force is 66 N, then the work done is

(A) 3 J

(B) 906 J

(C) 321 J

(D) 304 J

(E) 528 J

13. Which of the following has the greatest momentum?

(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 12 kg ball moving at 1 m/s

14. Which of the following requires the greatest average force?

(A) Accelerating a 7 kg ball from 30 m/s to 39 m/s in one second

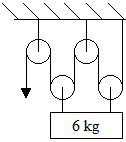
(B) Accelerating a 16 kg ball from 12 m/s to 20 m/s in two seconds

(C) Aecelerating a 9 kg ball from 21 m/s to 14 m/s in one second

(D) Decelerating a 20 kg ball from 10 m/s to 4 m/s in two seconds

(E) Decelerating a 20 kg ball from 10 m/s to 4 m/s in six seconds

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



(A) 12 N

(B) 15 N

(C) 20 N

(D) 30 N

(E) 98 N

16. Molybdenum-99 has a half-life of 67 h. If a 1 mg sample is left for 335 hours, how much molybdenum remains?

(A) 0.031 mg

(B) 0.062 mg

(C) 0.124 mg

(D) 0.248 mg

(E) 0.268 mg

17. What depth of water creates 1 atm of pressure?

(A) 1 m

(B) 5 m

(C) 10 m

(D) 20 m

(E) 50 m

18. 2 one liter containers are filled with the same viscous fluid via different size funnels. The cross-sectional area of the stem on the first funnel is twice as large as the cross-sectional area of the stem on the second funnel. If the first container is filled in 24 seconds, which of the following could be the time required to fill the second container?

(A) 24 s

(B) 42 s

(C) 48 s

(D) 54 s

(E) 64 s

19. A 10 kg mass is dropped from a height of 125 m. What is its speed at impact with the ground?

(A) 20 m/s

(B) 50 m/s

(C) 75 m/s

(D) 125 m/s

(E) 150 m/s

20. If the frequency of a wave is 200 Hz, and the wavelength is 2 m, how much time is required for a single wave to pass by an observer?

(A) 0.005 s

(B) 0.050 s

(C) 200 s

(D) 400 s

(E) 500 s

21. A 2 kg mass bounces on the end of a spring completing one period every 2*π* seconds. What is the spring constant for the spring?

(A) 0.5 N/m

(B) 1 N/m

(C) 2 N/m

(D) 4 N/m

(E) 5 N/m

22. When placed a distance d from a positive point charge a positively charged particle has a potential energy U due to the electric field created by the point charge. If the charged particle is moved to a distance 2d, which of the following represents its potential energy?

(A)

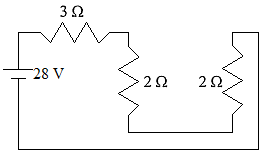
(B)

(C)

(D) 2*U*

(E) 4*U*

23. What is the current across the 3 ohm resistor?



(A) 4 A

(B) 6 A

(C) 7 A

(D) 8 A

(E) 10 A

24. Calculate the magnitude of the electrostatic force between two point charges, each of which has a deficit of ten billion electrons and which are separated by 1 cm.

(A) 1.4×10-8 N

(B) 2.3×10-8 N

(C) 9.0×10-4 N

(D) 1.4×10-4 N

(E) 1.8×10-4 N

25. The angular speed of a flywheel making 120 rev/min is:

(A) rad/s

(B) rad/s

(C) 4*π* rad/s

(D) 4*π*2 rad/s

(E) rad/s

26. The instantaneous acceleration of a particle executing simple harmonic motion *y* = *A*sin*ωt* is given by:

(A) +*ω*2*y*

(B) -*ω*2*y*

(C) -*ωy*

(D) +*ωy*

(E) +2*ω*2*y*

27. For driving a current of 2 A for 6 min in a circuit 1000 J of work is to be done. The emf of the source in the circuit is:

(A) 1.38 V

(B) 13.8 V

(C) 73.3 V

(D) 7.3 V

(E) 14.5 V

28. A tank is filled with a transparent liquid to a height of 1 m. When seen from above its bottom appears to be shifted upward by a distance 0.1 m the refractive index of liquid is:

(A)

(B)

(C)

(D)

(E)

29. A charged particle is moving in a uniform magnetic field in a circular path of radius *R*. When energy of the particle is doubled, then the new radius will be:

(A) *R*2

(B) *R*

(C)

(D) 2*R*2

(E) 2*R*

30. 1 MeV is:

(A) 1.6×10-20 J

(B) 1.6×10-18 J

(C) 1.6×10-22 J

(D) 1.6×10-24 J

(E) 1.6×10-19 J