1. A particle accelerates at 10 m/s2 for 2 seconds. If its initial velocity was 5 m/s, what is its final velocity?

(A) 15 m/s

(B) 20 m/s

(C) 25 m/s

(D) 50 m/s

(E) 100 m/s

2. A particle moving at 5 m/s reverses its direction in 1 s to move at 5 m/s in the opposite direction. If its acceleration is constant, what is its displacement at 1 s?

(A) 0 m

(B) 1.25 m

(C) 2.5 m

(D) 5 m

(E) 8 m

3. A 5 kg block moving at 5 m/s experiences a net force of 10 N in a direction opposite to 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. A 2 kg block rests on an inclined plane with an angle of 30°. A force of 5 N is applied to the block in a direction down the incline plane. If the block doesn’t move, what is the static frictional force on the block?

(A) 5 N

(B) 15 N

(C) 20 N

(D) 25 N

(E) 30 N

5. A 10 kg mass hangs from a spring that follows Hooke’s Law. If the spring has a spring constant of 200 N/m, how far does the spring distend from its rest position?

(A) 0.05 m

(B) 0.5 m

(C) 20 m

(D) 2000 m

(E) 2500 m

6. A 78 kg astronaut far pushes away from a 388 kg asteroid. Both are free of interfering gravitational fields. If the astronaut accelerates at -3.65 m/s2 what is the acceleration of the asteroid?

(A) 0.734 m/s2

(B) 4.055 m/s2

(C) 1.307 m/s2

(D) 2.433 m/s2

(E) 3.483 m/s2

7. A 32 kg mass is raised by a rope. If the velocity of the mass remains constant at 2 m/s, what is the tension in the rope?

(A) 256 N

(B) 320 N

(C) 384 N

(D) 640 N

(E) 800 N

8. What is the escape velocity from a planet with a radius of 1.98×106 m and a mass of 7.25×1022 kg?

(A) 1222 m/s

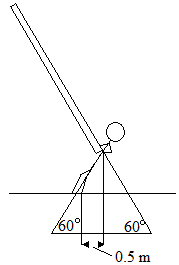
(B) 500 m/s

(C) 1212 m/s

(D) 2207 m/s

(E) 1100 m/s

9. A 75 kg man holds a 25 kg pole at a 60° angle as shown. He leans backward at a 60° angle so that his center of gravity is 0.5 m to the right of his feet. How long is the pole?



(A) 4 m

(B) 6 m

(C) 7 m

(D) 8 m

(E) 9 m

10. The spring on a jack-in-the-box has a spring constant of 400 N/m. The spring is compressed by 20 cm when the box is closed. If the jack-in-the-box has a mass of 1 kg, what will be its speed when it is opened and the spring reaches its rest length? (Note: Ignore gravity.)

(A) 2 m/s

(B) 4 m/s

(C) 6 m/s

(D) 8 m/s

(E) 10 m/s

11. A 100 W light bulb is left on for 2 days. How many 20 cm steps must a 60 kg women climb to bum the same amount of energy?

(A) 1,440

(B) 14,400

(C) 144,000

(D) 1,440,000

(E) 14,400,000

12. A body loses 3920 J of potential energy in falling through 80 m. If the gravitational acceleration is 9.8 m/s2, then the body has a mass of

(A) 20 kg

(B) 15 kg

(C) 10 kg

(D) 2 kg

(E) 5 kg

13. Which of the following would require the greatest force to stop in just one second?

(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 3 m/s

14. An infinitely long cylinder of radius 4 cm carries a uniform volume charge density *ρ* = 200 nC/m3. What is the electric field at *r* = 3.9 cm?

(A) 0.12 kN/C

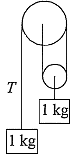
(B) 0.44 kN/C

(C) 57 N/C

(D) 0.11 kN/C

(E) 0.23 kN/C

15. What is the tension T in the rope?



(A) 5 N

(B) 6 N

(C) 10 N

(D) 12 N

(E) 15 N

16. A sample containing 50 grams of Radium-226 has 6.25 grams after 5000 years. Determine the half life of radium-226.

(A) 1299 years

(B) 1319 years

(C) 1459 years

(D) 1597 years

(E) 1667 years

17. A charge of 2 mC is located in a uniform electric field of intensity 4×105 N/C. How much work is required to move this charge 20 cm along a path making an angle of 60° with the electric field?

(A) 0.14 J

(B) 80 mJ

(C) 22 mJ

(D) 14 J

(E) 8 J

18. A cue ball (mass 225 g), moving at 0.5 m/s, strikes the 8-ball (mass 200 g) originally at rest. After the collision, the cue ball moves with a velocity of 0.1 m/s. Find the velocity of the 8-ball after the collision.

(A) 0.23 m/s

(B) 0.30 m/s

(C) 0.68 m/s

(D) 0.90 m/s

(E) 0.45 m/s

19. Two parallel horizontal plates are spaced 0.4 cm apart in air. You introduce an oil droplet of mass 4.9×10–17 kg between the plates. If the droplet carries two electronic charges and if there were no air buoyancy, you could hold the droplet motionless between the plates if you kept the potential difference between them at

(A) 6 V

(B) 12 V

(C) 3 V

(D) 0.12 kV

(E) 60 V

20. A 100 m rope is stretched tightly between two poles. When the rope is plucked near one pole, a wave with a wavelength of 25 cm reaches the other pole in 2 s. What is the frequency of the wave?

(A) 50 Hz

(B) 12.5 Hz

(C) 200 Hz

(D) 400 Hz

(E) 500 Hz

21. Two parallel metal plates 0.35 cm apart have a potential difference between them of 175 V. The electric force on a positive charge of 6.4×10–19 C at a point midway between the plates is approximately

(A) 4.8×10–18 N

(B) 3.2×10–14 N

(C) 1.6×10–18 N

(D) 4.8×10–16 N

(E) 1.2×10–14 N

22. A particle with charge q experiences a force F when placed a distance d from a point charge. At distance d, the electric field has a strength E and a potential V. Which of the following represents the potential energy of the charge?

(A) Fd

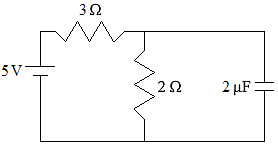
(B) Eqd

(C) Vq

(D) Ed

(E) 2Eqd

23. What is the energy stored in the capacitor?



(A) 1J

(B) 2J

(C) 4J

(D) 8J

(E) 10J

24. A ball moving horizontally towards the left with speed 5 m/s collides with a vertical wall which is moving to the right with a speed of 5 m/s and rebounds. After rebounding the speed of the ball relative to ground will be:

(A) 6 m/s

(B) 12 m/s

(C) 15 m/s

(D) 18 m/s

(E) 24 m/s

25. A satellite orbiting the circular orbit of radius *R* completes one rev in 3 hours. If orbital radius of geostationary satellite is 36000 km, the orbital radius *R* of satellite is:

(A) 3000 km

(B) 9000 km

(C) 10000 km

(D) 18000 km

(E) 30000 km

26. The instantaneous displacement of a simple pendulum oscillator is given by

*x* = *A*cos(*ωt*+()). Its velocity will be maximum at time:

(A)

(B)

(C)

(D)

(E)

27. The emf produced in a coil is 5 V when current is changed at the rate of 20 A/s. The magnetic energy stored in the coil when a current of 0.2 A flows through it is:

(A) 2×10-3 J

(B) 6×10-3 J

(C) 5×10-3 J

(D) 0.32 J

(E) 0.64 J

28. A block of mass 4 kg is placed on a rough horizontal plane. A time dependent horizontal force *F* = *kt* acts on the block, *k* = 2 N/s2. The frictional force between the block and plane at time *t* = 2 s is: (*µ* = 0.2)

(A) 4 N

(B) 8 N

(C) 16 N

(D) 0

(E) 2 N

29. A beam of electrons moving at a speed of 106 m/s along a line produces a current of 1.6×10-6 A. The number of electrons in 1 m of the beam is:

(A) 108

(B) 107

(C) 105

(D) 1010

(E) 109

30. The time period of a simple pendulum length *L* as measured in an elevator descending with acceleration is:

(A)

(B)

(C)

(D)

(E)