1. A body starts falling from height *h* and travels distance during last second of motion then time of flight is (In second):

(A)

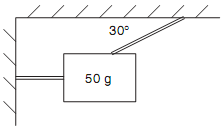
(B)

(C)

(D)

(E)

2. A 50 g mass is hung by string as shown in the picture below. The left-hand string is horizontal, the angled string measures 30° to the horizontal. What is the tension in the angled string?



(A) 0.5 N

(B) 4 N

(C) 1.5 N

(D) 2 N

(E) 1 N

3. A ﬁrework is shot straight up in the air with an initial speed of 50 m/s. What is the maximum height it reaches?

(A) 12.5 m

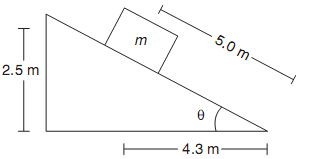
(B) 25 m

(C) 125 m

(D) 250 m

(E) 1250 m

4. A block of weight *mg* = 100 N slides a distance of 5.0 m down a 30 degree incline, as shown below. How much work is done on the block by gravity?



(A) 500 J

(B) 430 J

(C) 100 J

(D) 50 J

(E) 250 J

5. A pendulum has a period of 5 seconds on Earth. On Jupiter, where g = 30 m/s2, the period of this pendulum would be closest to

(A) 1 s

(B) 3 s

(C) 5 s

(D) 8 s

(E) 15 s

6. A 1 m3 container contains 10 moles of ideal gas at room temperature. At what fraction of atmospheric pressure is the gas inside the container?

(A) atm

(B) atm

(C) atm

(D) atm

(E) atm

7. A particle moves along the *x* axis from *xi* to *xf*. Of the following values of the initial and final coordinates, which results in the displacement with the largest magnitude?

(A) *xi* = 4 m, *xf*= 6 m

(B) *xi* = -4 m, *xf*= -8 m

(C) *xi* = -4 m, *xf*= 2 m

(D) *xi* = 4 m, *xf*= -2 m

(E) *xi* = -4 m, *xf*= 4 m

8. A car starts from Astana, goes 200 km in a straight line to Burabay, immediately turns around, and returns to Astana. The time for this round trip is 2 hours. The magnitude of the average velocity of the car for this round trip is:

(A) 0

(B) 50 km/hr

(C) 100 km/hr

(D) 200 km/hr

(E) 150 km/hr

9. A ball rolls up a slope. At the end of three seconds its velocity is 20 cm/s, at the end of eight seconds its velocity is 0. What is the average acceleration from the third to the eighth second?

(A) 2.5 cm/s2

(B) 4 cm/s2

(C) 5 cm/s2

(D) 6 cm/s2

(E) 6.67 cm/s2

10. The standard 1 kg mass is attached to a compressed spring and the spring is released. If the mass initially has an acceleration of 5.6 m/s2, the force of the spring has a magnitude of:

(A) 2.8 N

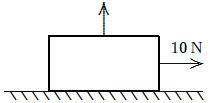
(B) 5.6 N

(C) 11.2 N

(D) 0

(E) 1 N

11. A crate with a weight of 50 N rests on a horizontal surface. A person pulls horizontally on it with a force of 10 N and it does not move. To start it moving, a second person pulls vertically upward on the crate. If the coefficient of static friction is 0.4, what is the smallest vertical force for which the crate moves?



(A) 4 N

(B) 10 N

(C) 14 N

(D) 25 N

(E) 35 N

12. A boy holds a 40 N weight at arm’s length for 10 s. His arm is 1.5 m above the ground. The work done by the force of the boy on the weight while he is holding it is:

(A) 0

(B) 6.1 J

(C) 40 J

(D) 60 J

(E) 90 J

13. Block *A*, with a mass of 4 kg, is moving with a speed of 2 m/s while block *B*, with a mass of

8 kg, is moving in the opposite direction with a speed of 3 m/s. The center of mass of the two block-system is moving with a velocity of:

(A) 1.3 m/s in the same direction as *A*

(B) 1.3 m/s in the same direction as *B*

(C) 2.7 m/s in the same direction as *A*

(D) 1.0 m/s in the same direction as *B*

(E) 5.0 m/s in the same direction as *A*

14. A solid wheel with mass *M*, radius *R*, and rotational inertia , rolls without sliding on a horizontal surface. A horizontal force *F* is applied to the axle and the center of mass has an acceleration *a*. The magnitudes of the applied force *F* and the frictional force *f* of the surface, respectively, are:

(A) *F* = *Ma*, *f* = 0

(B) *F* = *Ma*, *f* =

(C) *F* = 2*Ma*, *f* = *Ma*

(D) *F* = *Ma*, *f* =

(E) *F* = , *f* =

15. Let *F*1 be the magnitude of the gravitational force exerted on the Sun by Earth and *F*2 be the magnitude of the force exerted on Earth by the Sun. Then:

(A) *F*1 is much greater than *F*2

(B) *F*1 is slightly greater than *F*2

(C) *F*1 is equal to *F*2

(D) *F*1 is slightly less than *F*2

(E) *F*1 is much less than *F*2

16. A particle moves back and forth along the *x* axis from *x* = −*xm* to *x* = +*xm*, in simple harmonic motion with period *T*. At time *t* = 0 it is at *x* = +*xm*. When *t* =0.75*T*:

(A) It is at *x* = 0 and is traveling toward *x* = +*xm*

(B) It is at *x* = 0 and is traveling toward x = −*xm*

(C) It at *x* = +*xm* and is at rest

(D) It is between *x* = 0 and *x* = +*xm* and is traveling toward *x* = −*xm*

(E) It is between *x* = 0 and *x* = −*xm* and is traveling toward *x* = −*xm*

17. Let *f* be the frequency, *v* the speed, and *T* the period of a sinusoidal traveling wave. The angular frequency is given by:

(A)

(B)

(C)

(D)

(E)

18. Air enters a hot-air furnace at 7C and leaves at 77C. If the pressure does not change each entering cubic meter of air expands to:

(A) 0.8 m3

(B) 1.25 m3

(C) 1.9 m3

(D) 7 m3

(E) 11 m3

19. A 2 m3 weather balloon is loosely ﬁlled with helium at 1 atm (76 cm *Hg*) and at 27C. At an elevation of 20000 ft, the atmospheric pressure is down to 38 cm *Hg* and the helium has expanded, being under no constraint from the conﬁning bag. If the temperature at this elevation is -48C, the gas volume (in m3) is:

(A) 3

(B) 4

(C) 2

(D) 2.5

(E) 5.3

20. The total negative charge on the electrons in 1 kg of helium (atomic number 2, molar mass 4) is:

(A) 48 C

(B) 2.4×107 C

(C) 4.8×107 C

(D) 9.6×108 C

(E) 1.9×108 C

21. A total charge of 6.3×10−8 C is distributed uniformly throughout a 2.7 cm radius sphere. The volume charge density is:

(A) 3.7×10−7 C/m3

(B) 6.9×10−6 C/m3

(C) 6.9×10−6 C/m2

(D) 2.5×10−4 C/m3

(E) 7.6×10−4 C/m3

22. When a piece of paper is held with one face perpendicular to a uniform electric ﬁeld the ﬂux through it is 25 Nm2/C. When the paper is turned 25 with respect to the ﬁeld the ﬂux through it is:

(A) 0

(B) 12 Nm2/C

(C) 21 Nm2/C

(D) 23 Nm2/C

(E) 25 Nm2/C

23. Three particles lie on the *x* axis: particle 1, with a charge of 1×10−8 C is at *x* = 1 cm, particle

2, with a charge of 2×10−8 C, is at *x* = 2 cm, and particle 3, with a charge of −3 10−8 C, is at *x* = 3 cm. The potential energy of this arrangement, relative to the potential energy for inﬁnite separation, is:

(A) +4.9×10−4 J

(B) −4.9×10−4 J

(C) +8.5×10−4 J

(D) −8.5×10−4 J

(E) −9.8×10−4 J

24. The potential diﬀerence between two points is 100 V. If a particle with a charge of 2 C is transported from one of these points to the other, the magnitude of the work done is:

(A) 200 J

(B) 100 J

(C) 50 J

(D) 100 J

(E) 2 J

25. A 10 ohm resistor has a constant current. If 1200 C of charge ﬂow through it in 4 minutes what is the value of the current?

(A) 3 A

(B) 4 A

(C) 12 A

(D) 15 A

(E) 18 A

26. The normal to a certain 1 m2 area makes an angle of 60 with a uniform magnetic ﬁeld. The magnetic ﬂux through this area is the same as the ﬂux through a second area that is perpendicular to the ﬁeld if the second area is:

(A) 0.866 m2

(B) 1.15 m2

(C) 0.5 m2

(D) 2 m2

(E) 1 m2

27. A capacitor in an *LC* oscillator has a maximum potential diﬀerence of 15 V and a maximum energy of 360 µJ. At a certain instant the energy in the capacitor is 40 µJ. At that instant what is the potential diﬀerence across the capacitor?

(A) 1 V

(B) 5 V

(C) 10 V

(D) 15 V

(E) 20 V

28. The intensity of a uniform light beam with a wavelength of 500 nm is 2000 W/m2. The photon ﬂux (in number/m2s) is about:

(A) 5×1017

(B) 5×1019

(C) 5×1021

(D) 5×1023

(E) 5×1025

29. An atom is in a state with orbital quantum number *l* = 2. Possible values of the magnetic quantum number *ml* are:

(A) 1, 2

(B) 0, 1, 2

(C) 0, 1

(D) −1, 0, 1

(E) −2, −1, 0, 1, 2

30. A capacitor of capacity *C* and reactance *X* if capacitance and frequency become double then reactance will be:

(A) 4*X*

(B) 0.5*X*

(C) 0.25*X*

(D) 2*X*

(E) *X*