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

(A) 5 m/s2

(B) 10 m/s2

(C) 15 m/s2

(D) 20 m/s2

(E) 25 m/s2

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 the magnitude of its acceleration?

(A) 2.5 m/s2

(B) 5 m/s2

(C) 10 m/s2

(D) 20 m/s2

(E) 25 m/s2

3. A 5 kg block moving at 5 m/s experiences a net force of 10 N in a direction perpendicular 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 a plane inclined at 30°. What is the static frictional force on the block?

(A) 5 N

(B) 10 N

(C) 15 N

(D) 20 N

(E) 25 N

5. A certain object follows Hooke’s Law. How much force is necessary to depress the surface of the object a distance x if it has spring constant k.

(A) *k*

(B) *kx*

(C) *kx*2

(D) 0.5*kx*2

(E) 2*kx*2

6. Point charges of 4.0×10–8 C and –2.0×10–8 C are placed 12 cm apart. A third point charge of 3.0×10–8 C halfway between the first two point charges experiences a force of magnitude

(A) 1.5×10–2 N

(B) 2.0×10–3 N

(C) 4.5×10–3 N

(D) 3.5×10–3 N

(E) 5.0×10–3 N

7. An electron is released from rest in a uniform electric field. If the electric field is 3.65 kN/C, at the end of 15 ns the electron's velocity will be approximately

(A) 9.6×106 m/s

(B) 3.9×103 m/s

(C) 3.1×108 m/s

(D) 5.5×103 m/s

(E) 7.4×106 m/s

8. What is the gravitational field (in N/kg) 2287 km above a planet with a mass of 6.84×1022 kg and a radius of 2.28×106 m?

(A) 1.21 N/kg

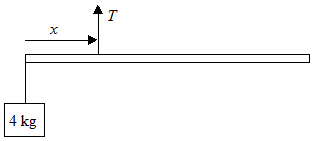
(B) 4.4 N/kg

(C) 3 N/kg

(D) 1.222 N/kg

(E) 0.218 N/kg

9. A one meter board with a mass of 16 kg hangs by a rope as shown. A 4 kg mass is hung from the left end of the board. If the board is to be balanced level to the ground, what is the distance x from the left end that the rope with the tension T must be attached?



(A) 0.1 m

(B) 0.2 m

(C) 0.3 m

(D) 0.4 m

(E) 0.5 m

10. A 4 kg projectile has 1400 J of kinetic energy when it leaves the ground. If it has 120 J of kinetic energy at its highest point, how high did it travel?

(A) 3 m

(B) 30 m

(C) 32 m

(D) 35 m

(E) 40 m

11. A 5000 kg rocket moves straight up at 30 m/s near the earth’s surface. What is the minimum power of the rocket’s engines?

(A) 6W

(B) l06 W

(C) 1.5l06 W

(D) 3.0l06 W

(E) 4.0l06 W

12. A boy throws a ball vertically upwards from ground level. If the ball reaches a maximum height of 250 m and the gravitational acceleration is 9.8 m/s2, with what speed did the boy throw the ball?

(A) 70 m/s

(B) 15 m/s

(C) 20 m/s

(D) 149 m/s

(E) 45 m/s

13. Which of the following has the greatest inertia?

(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 8 m/s

14. An engineer designs a machine that lifts a 5 kg object to a height h. If the force required is 10 N, what is the minimum distance over which this force must be applied?

(A) 0.5*h*

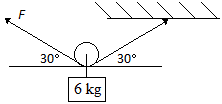
(B) *h*

(C) 2*h*

(D) 5*h*

(E) 10*h*

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



(A) 15 N

(B) 30 N

(C) 60 N

(D) 120 N

(E) 180 N

16. The difference between the mass of one oxygen atom and the sum of the masses of its parts is approximately 2.2710-28 kg. What is the binding energy that holds an oxygen atom together? (Note: the charge on one electron is 1.6l0-19 C).

(A) 1.9l0-14 eV

(B) 1.9l0-11 eV

(C) 1.2l05 eV

(D) 1.2l08 eV

(E) 1.2l06 eV

17. A disk of radius 10 cm carries a uniform surface charge density of 6.0 µC/m2. The electric field on the axis of the disk at a distance of 0.10 cm is approximately

(A) 0.24 MN/C

(B) 68 kN/C

(C) 0.34 MN/C

(D) 0.54 MN/C

(E) 18 kN/C

18. After their isolated collision, two balls move in opposite directions: Ball #1 moves at 0.2 m/s in the negative x direction, and Ball #2 moves at 0.5 m/s in the positive x direction. If the mass of each ball is 100 grams, determine the total momentum of this system before the collision.

(A) 0.06 kg∙m/s

(B) 0.07 kg∙m/s

(C) 0.30 kg∙m/s

(D) 0.70 kg∙m/s

(E) 0.03 kg∙m/s

19. An object of mass 2 kg floats motionless in a fluid of specific gravity 0.8. What is the magnitude of the buoyant force? (Use g = 10 m/s2.)

(A) 8 N

(B) 16 N

(C) 20 N

(D) 25 N

(E) 30 N

20. If the frequency of a wave is 200 Hz, and the velocity is 10 m/s, what is the wavelength?

(A) 0.05 m

(B) 0.5 m

(C) 20 m

(D) 2000 m

(E) 5000 m

21. A uniform line charge of linear charge density λ = 5.00 nC/m extends from *x* = 0 to *x* = 10 m. The magnitude of the electric field at the point *y* = 12 m on the perpendicular bisector of the finite line of charge is

(A) 18.8 N/C

(B) 15.3 N/C

(C) 2.88 N/C

(D) 4.27 N/C

(E) 5.18 N/C

22. A cube of side 3.56 cm has a charge of 9.11 µC placed at its center. Calculate the electric flux through one side of the cube.

(A) 1.03×106 Nm2/C

(B) 2.58×105 Nm2/C

(C) 8.13×108 Nm2/C

(D) 1.72×105 Nm2/C

(E) 1.35×108 Nm2/C

23. A hollow metal sphere has a total charge of 100 µC. If the radius of the sphere is 50 cm, the electric field intensity at a distance of 3.0 m from the surface of the sphere is approximately

(A) 7.4×104 N/C

(B) 2.6×105 N/C

(C) 1.0×105 N/C

(D) 2.7×104 N/C

(E) 3.6×106 N/C

24. A voltage *V* is applied across a parallel plate capacitor (plate area *A*, separation *d*) filled with a linear dielectric of dielectric constant *K*. The electric field strength between the plates is:

(A)

(B)

(C)

(D)

(E)

25. An object of mass *m* is attached to a vertically hanging spring. It is released suddenly from the unstretched position of the spring. The maximum expansion of spring is:

(A)

(B)

(C)

(D) 0

(E) 2*mg*

26. A particle of mass 0.5 kg is moving in the *x*, *y* plane with uniform speed of 3 m/s parallel to *y*-axis and crosses the *x*-axis at 2 m from origin. The angular momentum about origin is:

(A) 0

(B) 3 kgm2/s

(C) 6 kgm2/s

(D) 8 kgm2/s

(E) 9 kgm2/s

27. An object is magnified 10 times using a lens of focal length *f* when the image is projected on the screen. The distance of the screen from the lens is:

(A)

(B)

(C) 11*f*

(D) 10*f*

(E) 0.2*f*

28. The magnetic field due to small bar magnet at a distance 24 cm on the transverse axis of magnet is *B* and the magnetic field at a distance *d* from the magnet along longitudinal axis is 16*B*. Then the distance *d* is:

(A) 12 cm

(B) 12 cm

(C) 12 cm

(D) 16 cm

(E) 14 cm

29. At a certain time, a radioactive sample contains 2×1020 atoms and its disintegration rate 3×1010 atoms/s. When 2×1015 atoms are left to decay, its disintegration rate will be:

(A) 0.5×1010 atoms/s

(B) 0.693×3 ×1010 atoms/s

(C) 3×105 atoms/s

(D) 3×1010 atoms/s

(E) 3×1015 atoms/s

30. The equation of travelling wave in a stretched string is *y* = 0.5sin*π*(()-50*t*). The maximum transverse speed of any point of string will be: (*x* and *y* are in cm)

(A) 25 cm/s

(B) 75 cm/s

(C) 25*π* cm/s

(D) 75*π* cm/s

(E) 15*π* cm/s