1. A constantly accelerating particle travels for 3 s. If its initial velocity is 10 m/s and it travels 75 m, what is its final velocity?

(A) 20 m/s

(B) 25 m/s

(C) 30 m/s

(D) 40 m/s

(E) 50 m/s

2. A projectile launched straight up at 10 m/s will strike the ground at:

(A) 5 m/s

(B) 10 m/s

(C) 25 m/s

(D) 50 m/s

(E) 75 m/s

3. Sky Lab with its weightless astronauts orbited the earth 444 km above its surface. The radius of the earth is approximately 6370 km. If g = 9.8 m/s2, what was the correct value for g on Sky Lab?

(A) 0 m/s2

(B) 8.5 m/s2

(C) 9.8 m/s2

(D) 10.4 m/s2

(E) 12 m/s2

4. A 100 kg object is dropped from a plane. If in the first few seconds, it accelerates at an average of 7 m/s2, what is the average force of air resistance acting on the object during this time?

(A) 0 N

(B) 300 N

(C) 700 N

(D) 1000 N

(E) 1200 N

5. A rocket lifting off the Earth's surface weighed 4672 N and its motor developed an upward force of 23885 N. What was the rocket's acceleration?

(A) 57 m/s2

(B) 62.8 m/s2

(C) 14 m/s2

(D) 73 m/s2

(E) 40.3 m/s2

6. A boy swings a 18.8 kg stone in a horizontal circle with a radius of 0.59 m. The string breaks under 447 N of tension. What is the maximum speed the stone can have?

(A) 2.00 m/s

(B) 1.55 m/s

(C) 2.10 m/s

(D) 1.95 m/s

(E) 3.75 m/s

7. An electron is accelerated from rest by an electric field. After the acceleration, the electron is injected into a uniform magnetic field of 1.27×10–3 T. The velocity of the electron and the magnetic field lines are perpendicular to one another. The electron remains in the magnetic field for 5×10–9 s. The angle between the initial electron velocity and the final electron velocity is

(A) 0.5 rad

(B) 5.8×10–2 rad

(C) 8.68×10–2 rad

(D) 1.1 rad

(E) 2.3 rad

8. A ball is thrown from the top of a building with a horizontal velocity of 15.9 m/s, and lands 52.4 m away from the base of the building. How high is the building?

(A) 18.2 m

(B) 64 m

(C) 100 m

(D) 45.4 m

(E) 53.2 m

9. A hiker travels 1.53 m/s up a slope inclined at 21.4º above the horizontal. The slope is 22.6 m long. How much power does the hiker expend to get up the slope if he and his equipment have a mass of 100 kg?

(A) 140 W

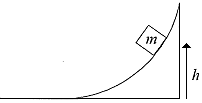
(B) 800 W

(C) 400 W

(D) 123 W

(E) 547 W

10. The block has a mass of 50 g and h is 20 cm. The block has an initial velocity of 2 m/s, and slides down the curve. If the coefficient of kinetic friction between the block and the flat portion of the ramp is 0.2, how far does the block travel along the flat portion of the ramp?



(A) 0.5 m

(B) 1 m

(C) 2 m

(D) 5 m

(E) 9.8 m

11. A 0.126 kg ball is thrown at 13.1 m/s at an angle of 30º above the horizontal. What is the kinetic energy of the baseball at the highest point of the trajectory?

(A) 3 J

(B) 6 J

(C) 12.1 J

(D) 6.14 J

(E) 8.11 J

12. A carton is pulled along the ground for a distance of 10 m. If the average frictional force is 81 N, then the work done is

(A) 210 J

(B) 420 J

(C) 880 J

(D) 810 J

(E) 568 J

13. A small object moving at 10 m/s to the right collides with a heavier object that is initially stationary. Which of the following is not a possible velocity of the smaller object after the collision?

(A) 1 m/s to the right

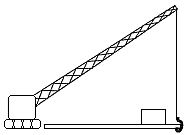
(B) 5 m/s to the right

(C) 1 m/s to the left

(D) 5 m/s to the left

(E) 9 m/s to the left

14. The crane below uses a steel cable to lift one end of a 10 m, 1000 kg iron sheet of uniform density. A 100 kg box sits on the sheet 2 m from its right end. What is the minimum tension in the cable?



(A) 5200 N

(B) 5500 N

(C) 5800 N

(D) 11000 N

(E) 15000 N

15. An electron passes through a region where there is an electric field *E* = 4×105 V/m and a magnetic field *B* = 0.09 T. The directions of the electric field, the magnetic field, and the electron velocity are mutually perpendicular. If the electron is not deflected from its straight-line path through these fields, its velocity must be

(A) 4.4×106 m/s

(B) 5×105 m/s

(C) 2.2×10–7 m/s

(D) 1.2×104 m/s

(E) 2.2×106 m/s

16. A block of a certain substance measures (4×3×10)cm and weighs 60 grams. A second block of the same substance measures (40×30×100)cm. What is the density of the second block?

(A) 5l02 kg/m3

(B) l03 kg/m3

(C) 2l03 kg/m3

(D) 5l03 kg/m3

(E) 5l04 kg/m3

17. A beam of electrons moving at a speed of 8×104 m/s is undeflected when it passes through an electric field of 5 N/C perpendicular to its path and a magnetic field that is perpendicular to its path and also to that of the electric field. Calculate the strength of the magnetic field.

(A) 1.6×104 T

(B) 2.25×10–5 T

(C) 7.81×10–10 T

(D) 6.25×10–5 T

(E) 1.25×10–4 T

18. What magnitude of work must be done to bring a 1000 kg car, moving at 20 m/s, to rest?

(A) 20 J

(B) 100 J

(C) 200 J

(D) 300 kJ

(E) 200 kJ

19. A racehorse makes one lap around a 500 meter track in a time of 25 seconds. What was the racehorse’s average speed?

(A) 10 m/s

(B) 7.5 m/s

(C) 75 m/s

(D) 11.8 m/s

(E) 20 m/s

20. In a mass spectrometer ions of *Ni* with mass 9.62×10–26 kg and charge +2*e* are accelerated through a potential difference of *X* volts and then deflected in a magnetic field of 0.15 T. If the radius of curvature of the ions is 0.55 m, then calculate the value of the potential difference *X*.

(A) 5.7 kV

(B) 274 kV

(C) 11.3 kV

(D) 13.7 kV

(E) 8.3 kV

21. Find the force that must be provided to lift a 49 N object with an acceleration of 9.8 m/s2, (g = 9.8 m/s2.)

(A) 49 N

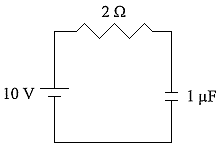
(B) 196 N

(C) 25 N

(D) 149 N

(E) 98 N

22. What is the voltage across the capacitor and the charge on the capacitor?



(A) 5 V, 10-7 C

(B) 5 V, 10-5 C

(C) 10 V, 10-7 C

(D) 10 V, 10-5 C

(E) 10 V, 10-11 C

23. When connected to a standard household voltage of 120 V, a light bulb draws 1.5 A of current. What is the wattage of the light bulb?

(A) 220 W

(B) 80 W

(C) 120 W

(D) 150 W

(E) 180 W

24. An alpha particle has a charge of +2*e* (*e* = 1.6×10–19 C) and is moving at right angles to a magnetic field *B* = 0.27 T with a speed *v* = 6.15×105 m/s. The force acting on this charged particle is

(A) Zero

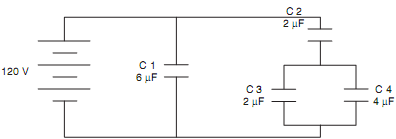
(B) 2.3×10–14 N

(C) 3.3×105 N

(D) 5.3×10–14 N

(E) 4.8×105 N

25. The charge stored in the 4 µF capacitor *C*4 is nearest to



(A) 120 µC

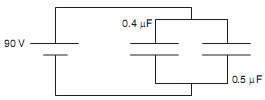
(B) 240 µC

(C) 360 µC

(D) 480 µC

(E) 600 µC

26. Two capacitors, 0.4 µF and 0.5 µF are connected in parallel and charged to a 90 V potential difference. The capacitors are now discharged and reconnected in series with the same power source. The new total charge acquired is nearest to



(A) 0.2 µC

(B) 2 µC

(C) 20 µC

(D) 200 µC

(E) 2000 µC

27. Other than infinity, in which region is the electric field strength zero?



(A) I

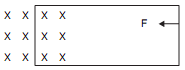
(B) II

(C) III

(D) IV

(E) V

28. The current in the wire is flowing



(A) Into the page.

(B) Out of the page.

(C) Clockwise.

(D) Counterclockwise.

(E) None of the above.

29. A small permanent magnet is placed in a uniform magnetic field of magnitude 0.35 T. If the maximum torque experienced by the magnet is 0.5 N·m, what is the magnitude of the magnetic moment of the magnet?

(A) 1.4 A·m2

(B) 0.7 A·m2

(C) 0.18 A·m2

(D) 2.8 A·m2

(E) 0.35 A·m2

30. The work necessary to move a point charge of 3×10–3 C from the origin to another point 2 m away is 4.5 J. The potential difference between the two points is

(A) 4.5×10–4 V

(B) 1.5×10–3 V

(C) 3×10–2 V

(D) 103 V

(E) 1.5×103 V