1. A constantly accelerating particle reaches a 100 m/s. If its average velocity is 75 m/s, what was its initial velocity?

(A) 0

(B) 25 m/s

(C) 50 m/s

(D) 75 m/s

(E) 100 m/s

2. An object is dropped from a height *h* and strikes the ground in time t. If the object is dropped from a height of 2*h*, which of the following represents the time it will take to strike the ground?

(A) *t*

(B) 1.4*t*

(C) 2*t*

(D) 4*t*

(E) 8*t*

3. A 5 kg block accelerates at 10 m/s2. What is the magnitude of the net force?

(A) 50 N

(B) 0.5 N

(C) 2 N

(D) 20 N

(E) 80 N

4. A 4 kg block is placed on a plane inclined at an angle of 30°. If the coefficient of static friction is 0.3 and the coefficient of kinetic friction is 0.2, what is the net force on the block?

(A) 0

(B) 8.3 N

(C) 10 N

(D) 40 N

(E) 80 N

5. A 3 m long board has one end raised to a height of 60 cm to form an incline. A 4 kg mass is allowed to slide without friction down the entire length of the inclined plane. What is the final speed of the mass when it reaches the bottom?

(A) 5 m/s

(B) 2 m/s

(C) 4 m/s

(D) 3 m/s

(E) 3.4 m/s

6. A wagon with a mass of 23.8 kg is accelerating at 1.5 m/s2. The wagon is being pulled by its handle which makes an angle of 38.3º to the ground, and there is a frictional force of 5.04 N. What is the force acting on the handle?

(A) 19.1 N

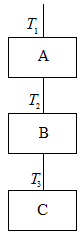
(B) 13.3 N

(C) 13.2 N

(D) 40.1 N

(E) 50.5 N

7. Boxes *A*, *B*, and *C* each have a mass of 10 kg. If the boxes are accelerated upward at 2 m/s2, what is the tension T2?



(A) 110 N

(B) 220 N

(C) 240 N

(D) 360 N

(E) 400 N

8. A stone is thrown straight up. To reach a height of 5.74 m above its release point, what must its initial speed be?

(A) 1.49 m/s

(B) 4 m/s

(C) 9.8 m/s

(D) 12.2 m/s

(E) 10.61 m/s

9. A 0.105 kg ball is thrown at 14.4 m/s at an angle of 32.8º above the horizontal. What is the kinetic energy of the baseball at the highest point of the trajectory?

(A) 4 J

(B) 12 J

(C) 12.8 J

(D) 14 J

(E) 7.69 J

10. A man puts springs on the bottoms of his shoes and jumps off a 10 m cliff. If the springs follow Hooke’s Law, the man should bounce to a height of:

(A) 5 m

(B) 7.5 m

(C) 10 m

(D) 20 m

(E) 25 m

11. A mass of 20 kg is located 4 m to the right of a mass of 30 kg. What is the force on the 20 kg mass?

(A) 7×10-9 N

(B) 1.5×10-9 N

(C) 1.2×10-9 N

(D) 2.5×10-9 N

(E) 2×10-9 N

12. A machine that produces 144 J of work by using 160 J of energy has an efficiency of

(A) 100 %

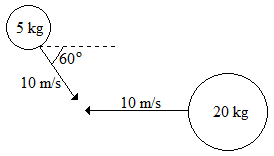
(B) 90 %

(C) 80 %

(D) 20 %

(E) 10 %

13. Two masses in space move toward each other and collide. Assume no rotational motion occurs before or after the collision. If the masses make an elastic collision, what will be the sum of their horizontal momentums after the collision?



(A) 150 kg m/s

(B) 175 kg m/s

(C) 200 kg m/s

(D) 225 kg m/s

(E) 250 kg m/s

14. A farmer has a 200 kg barrel that he must pull up a ramp to a height of 5 m. His old horse can apply a maximum force of only 1000 N and only for 4 s. What is the shortest distance that the farmer can make the ramp if the barrel starts from rest?

(A) 5 m

(B) 10 m

(C) 20 m

(D) 40 m

(E) 50 m

15. Polonium-218 undergoes alpha decay with a half life of 3.1 minutes. Approximately how much lead-214 would be formed from a sample of 109 g of Polonium-218 after 15.5 minutes?

(A) 0 g

(B) 3.3 g

(C) 21.8 g

(D) 103.7 g

(E) 110 g

16. 12 grams of water occupies:

(A) 1 cm3

(B) 1.2 cm3

(C) 12 cm3

(D) 120 cm3

(E) 1200 cm3

17. A 6 V storage battery supplies energy to a simple circuit at the constant rate of 48 W. The resistance of the circuit is

(A) 0.25 Ω

(B) 0.5 Ω

(C) 0.75 Ω

(D) 1 Ω

(E) 8 Ω

18. How much work is done by the gravitational force as a 10 kg object is lifted from a height of 1 m above the ground to a height of 3 m above the ground?

(A) 300 J

(B) 600 J

(C) 200 J

(D) 120 J

(E) -200 J

19. The specific gravity of ice is 0.92, and that of seawater is 1.025. What percentage of the volume of an iceberg is visible above the water?

(A) 20%

(B) 30%

(C) 40%

(D) 90%

(E) 10%

20. A source creates a sound that is observed at 400 W/m2. If the intensity level of the observed sound decreases by 10 decibels, what is the new observed intensity?

(A) 40 W/m2

(B) 80 W/m2

(C) 100 W/m2

(D) 390 W/m2

(E) 990 W/m2

21. A hockey puck slides on a surface of frictionless ice. If the mass of the puck is 250 grams, and it moves in a straight line with a constant velocity of 4 m/s, find the net force acting on the puck.

(A) 0.5 N

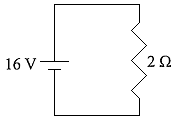
(B) 1 N

(C) 2 N

(D) 4 N

(E) 0 N

22. What is the voltage across the resistor and the current through the resistor in the circuit shown below?



(A) 8 V, 4 A

(B) 16 V, 8 A

(C) 16 V, 32 A

(D) 32 V, 8 A

(E) 32 V, 32 A

23. Calculate the force exerted on a point charge p with a charge of -5 µС, by two point charges, q1 and q2, which create a net electric field of 7×105 N/C toward the right at the position where p is placed.



(A) 3.5 N to the right

(B) 3.5 N to the left

(C) 35 N to the right

(D) 35 N to the left

(E) 70 N to the right

24. Two capacitors, 0.2 µF and 0.4 µF are connected in parallel and connected to an experimental battery whose terminals have a potential difference of 90 V. The total charge acquired by the combination is

(A) 0.054 µC

(B) 0.54 µC

(C) 5.4 µC

(D) 54 µC

(E) 540 µC

25. A 20 m long wire with resistivity 3×10–3 Ωcm and cross-sectional area 6×10–6 m2

has a resistance of

(A) 101 Ω

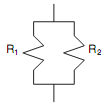
(B) 102 Ω

(C) 103 Ω

(D) 104 Ω

(E) 105 Ω

26. Resistors *R*1 and *R*2 are placed in parallel, as shown. If they have values of 5 Ω and 10 Ω, respectively, their combined equivalent resistance is



(A) 0.03 Ω

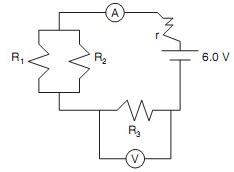
(B) 0.3 Ω

(C) 3 Ω

(D) 3.3 Ω

(E) 15 Ω

27. *R*1 = 1 Ω, *R*2 = 1 Ω, *R*3 = 1 Ω, and *r* = 0.1 Ω. The equivalent resistance of the circuit is most nearly



(A) 1 Ω

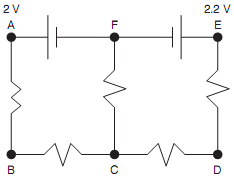
(B) 1.6 Ω

(C) 3 Ω

(D) 9.1 Ω

(E) 16 Ω

28. The current in the preceding illustration flows from



(A) *A* to *B*

(B) *B* to *C*

(C) *C* to *D*

(D) *C* to *F*

(E) *D* to *E*

29. An energy efficient light bulb uses 15 W of power for an equivalent light output of a 60 W incandescent light bulb. How much money do you save each month by using the energy efficient light bulb instead of the incandescent light bulb for 6 hours a day? Assume that 1 kW∙hr costs 14 cents and that there are 30 days in one month.

(A) $0.39

(B) $1.13

(C) $1.51

(D) $0.57

(E) $1.85

30. The value of the magnetic field at a point 10 cm from a wire carrying an electric current of 2 A is

(A) 4×10–6 T

(B) 4×10–2 T

(C) 4×102 T

(D) 4×104 T

(E) 4×106 T