Chapter 1

1. Displacement: $\Delta x = x_f - x_i$
2. Average velocity: $\overline{v} = \frac{\Delta x}{\Delta t} = \frac{x_f - x_i}{t_f - t_i}$
3. Average acceleration: $\overline{a} = \frac{\Delta v}{\Delta t} = \frac{v_f - v_i}{t_f - t_i}$
4. Instantaneous velocity: $v = \frac{dx}{dt}$
5. Instantaneous acceleration: $a = \frac{dv}{dt} = \frac{d^2x}{dt^2}$
6. Equations of motion with a constant acceleration:

$$v = v_0 + a(\Delta t)$$

$$\Delta x = \frac{1}{2}(v_0 + v)\Delta t$$

$$\Delta x = v_0 \Delta t + \frac{1}{2}a(\Delta t)^2$$

$$2a\Delta x = v^2 - v_0^2$$

Chapter 2

1. Associative property of vectors:
$$(\mathbf{A} + \mathbf{B}) + \mathbf{C} = \mathbf{A} + (\mathbf{B} + \mathbf{C})$$

2. Vector components: For $\mathbf{A} = A_x\hat{\imath} + A_y\hat{\jmath}$,

$$A_x = |\mathbf{A}| \cos\theta \ , A_y = |\mathbf{A}| \sin\theta$$

$$|\mathbf{A}| = \sqrt{{A_x}^2 + {A_y}^2} \ , \theta = \tan^{-1}\frac{A_y}{A_x}$$

where θ is the angle $\mathbf{A}$ makes with the +ive x-axis

Chapter 3

1. Weight $= mg$

2. Newton's 2nd Law: $F_{net} = ma$

3. Normal force N: consider <u>weight</u>, <u>surface angle</u>, <u>external forces</u> and <u>frictional forces</u>.

4. Frictional forces:
   Static friction: $f_s \leq \mu_s N$

   Kinetic friction: $f_k = \mu_k N$

Chapter 6

1. Definition of work: $W = F_{net}\, \Delta r\, \cos\theta$

   where θ is the angle $\boldsymbol{F}_{net}$ makes with the displacement direction.

2. In F-x plots, work = area under the curve
3. Kinetic energy: $K = \frac{1}{2}mv^2$
4. Gravitational potential energy: $U = mgy$
5. Conservation of energy:
$$\Delta K + \Delta U = -f_k d + \sum W_{other}$$
6. Average power: $\overline{P} = \frac{W}{\Delta t}$
7. Instantaneous power: $P = \frac{dW}{dt}$

Chapter 1

Q1. A jet plane lands with a speed of 100 m/s and it comes to rest with constant *de-acceleration* of -5.00 m/s^2. From the instant the plane touches the runway, the time needed before it comes to rest is:

a) 20 s **b)** 8 s **c)** 22 s **d)** 10 s **e)**none of the above

---

Q2. The velocity of a particle moving along the x-axis varies in time according to the expression: $v = 100 - 5t^2$ m/s, where t is in seconds. Find the average acceleration in the time interval between t = 2.0 s to t = 5.0 s.

a) 10 m/s^2 **b)** 18 m/s^2 **c)** -35 m/s^2 **d)** -31 m/s^2 **e)** 40 m/s^2

Q3. If an object accelerates from rest at 2.5 m/s^2 and moved a total distance of 24.2 m, its final speed will be:

a) 10 m/s **b)** 11 m/s **c)** 24 m/s **d)** 48 m/s

Q4. A car moves at a constant speed of 15 m/s. If the driver started to decelerate and stopped after 5 seconds, his acceleration will be:

a) -2 m/s^2 **b)** 3 m/s^2 **c)** 2 m/s^2 **d)** -3 m/s^2

Q5. The distance that an object, whose initial velocity is 8 m/s and acceleration is 2 m/s^2, moves in 10 seconds is:

a) 180 m **b)** 90 m **c)** 108 m **d)** 80 m

Q6. An object moves in a straight line with initial velocity of 5 m/s and acceleration of 1.5 m/s^2. After 20 seconds, the object will move a distance of:

a) 900 m **b)** 90 m **c)** 1800 m **d)** 400 m

Q7. A car is moving with a velocity of 72 km/h. If its velocity is reduced to 36 km/h after covering a distance of 200 m, its acceleration is:

a) -1.5 m/s^2 **b)** -2.5 m/s^2 **c)** -3.2 m/s^2 **d)** -0.75 m/s^2 **e)** -0.5 m/s^2

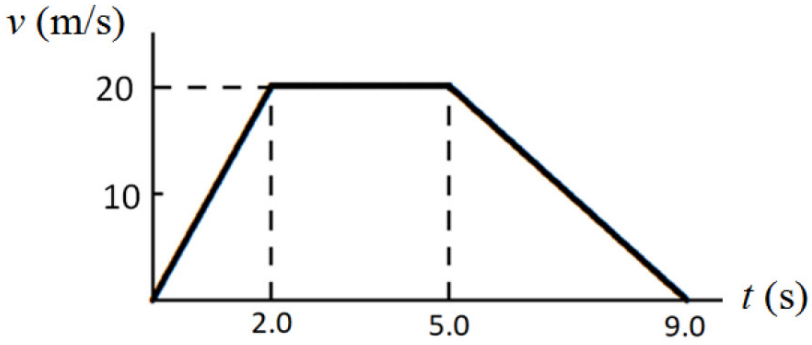
Q8. Two boys (Ali & Omar) start at one end of a street, the origin, run to the other end, then head back. On the way back Ali is ahead of Omar. Which statement is correct about the distances run and the displacements from the origin?

a) Ali has run a greater distance and his displacement is greater than Omar's.
b) Omar has run a greater distance and his displacement is greater than Ali's.
c) Ali has run a greater distance, but his displacement is less than Omar's.
d) Omar has run a greater distance, but his displacement is less than Ali's.
e) Omar has run a shorter distance, and his displacement is less than Ali's.

Q9. A car starts from rest at time $t = 0$, accelerates at a constant rate of 4.0 m/s² in a straight road and reaches a speed of 20 m/s. Then the car slows down at a constant rate until it stops at t = 9.0 s. Find the total distance travelled by the car for the entire motion.

a) 90 m **b)** 50 m **c)** 60 m **d)** 140 m **e)** 80 m

Q10. The graph below represents the straight-line motion of a car. Find the acceleration of the car at 7.1 s.



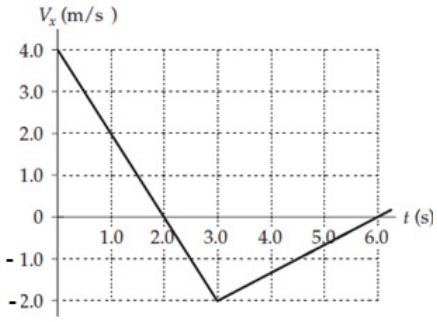
a) +5.0 m/s² **b)** -5.0 m/s² **c)** −10 m/s² **d)** +10 m/s² **e)** zero

---

Q11. The position of a particle moving along the x axis is given by: $x = 6t^2 - t^3$ where x is in meters and t is in seconds. What is the position of the particle at the instant when its acceleration is zero?

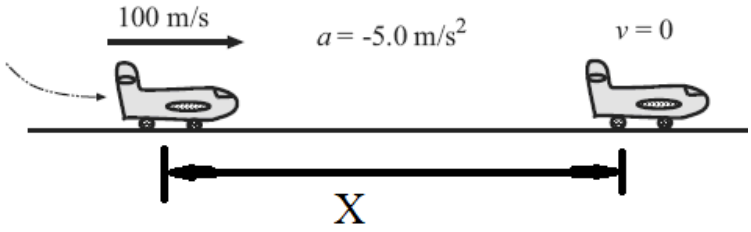
a) 32 m **b)** 12 m **c)** 24 m **d)** 20 m **e)** 16 m

Q12. The figure below shows the velocity V_x (m/s) of a particle moving along the x-axis. If x = 2.0 m at t = 1.0 s, what is the position, measured in meters, of the particle at t = 6.0 s?



a) -1 **b)** -2 **c)** +1 **d)** +2 **e)** +6

Q13. A jet plane lands with a speed of 100 m/s and decelerates with a = -5 m/s² as it comes to rest. From the instant it touches the runway; it moves a distance X and stops, as shown in the figure. What is the distance X, measured in meters?

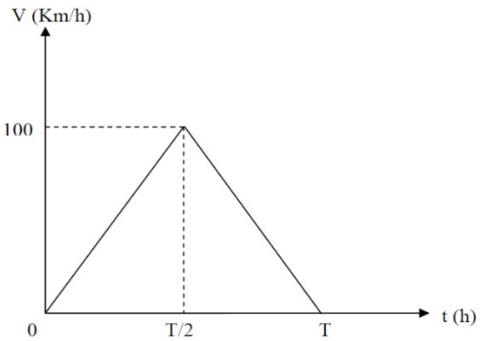


a) 800 **b)** 1000 **c)** 1100 **d)** 100 **e)** 900

Q14. The position of an object moving along an x-axis is given by $x = 3 + 12t - t^3$, where x is in meters and t is in seconds. At what time is the particle momentarily at rest?

a) 0 s **b)** 1 s **c)** 2 s **d)** 3 s **e)** 4 s

Q15. The velocity-time graph of a train traveling in a straight line from station A to station B, 10 km away, is shown in the Figure below. The train starts from A at t = 0 and arrives at B at t = T hours later. Find the acceleration of the train during the first half of the trip.

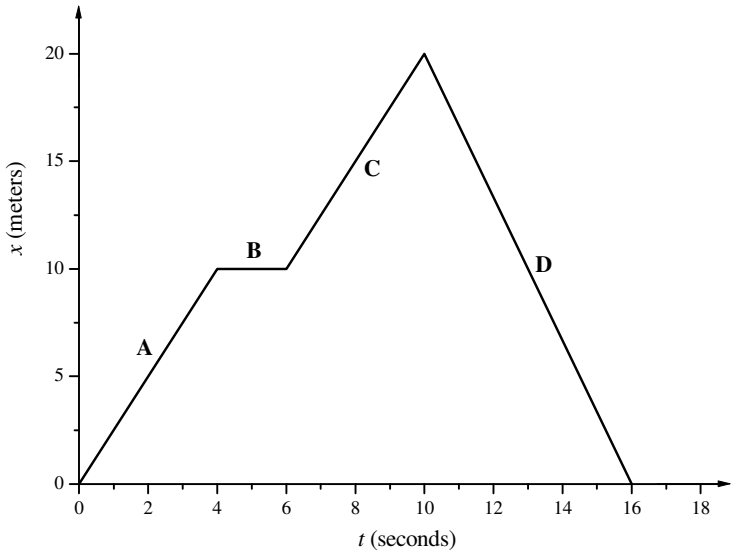


a) 1000 km/h² **b)** 1200 km/h² **c)** 2000 km/h² **d)** 3000 km/h² **e)** 6000 km/h²

Q16. The displacement of a car is given by $x = 5t^2 - 20t + 10$, where x is in meters and t is in seconds. The car was initially moving towards the East. At what time does it change direction and move towards the West?

a) 0.5 s **b)** 1 s **c)** 2 s **d)** 4 s **e)** Never

Q17. The graph below shows the position-time graph of a particle. Calculate the total distance moved by the particle?



a) zero **b)** 10 m **c)** 20 m **d)** 30 m **e)** 40 m

Q18. A particle accelerates from rest with a constant acceleration of 15 m/s^2. How long will the particle moves before it reaches a speed of 60 m/s? How far it will move?

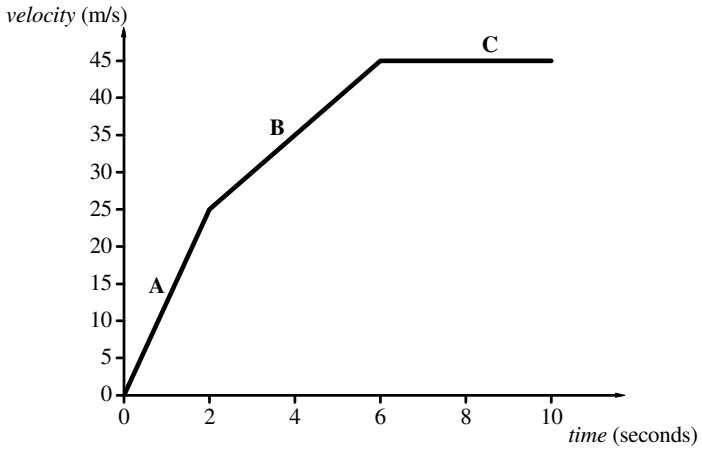
a) 1 s, 7.5 m **b)** 2 s, 30 m **c)** 3 s, 67.5 m **d)** 4 s, 120 m **e)** 5 s, 187.5 m

---

Q19. A car starts from rest until it reaches a speed of 25 m/s with an acceleration of 2 m/s^2. After that, the car decelerates (slows down) with deceleration of 1 m/s^2 until it stops. How much time elapsed from start to stop?

a) 12.5 s **b)** 25 s **c)** 37.5 s **d)** 50 s **e)** The car will never stop

Q20. The graph below shows the first 10 seconds velocity-time graph of a Tesla car journey. How far did the car move before reaching the speed of 45 m/s?



a) 450 m **b)** 345 m **c)** 270 m **d)** 180 m **e)** 165 m

Chapter 2

Q1. A hiker begins a trip by first walking 3.0 km to the west then walks 4.0 km in north direction, what is the magnitude and direction of his resultant displacement?

a) 5 km, 53.2° from the north to the west.
b) 7 km, 53.2° from the east to the north.
c) 25 km, 63.8° from the east to the north.
d) 7 km, 36.8° from the east to the north
e) 5 km, 53.1° from the west to the north.

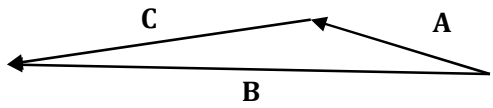
Q2. The magnitude of the sum of two vectors **A** and **B** is maximum, when

a) angle bet**w**een vectors **A** and **B** is 45°.
b) vectors **A** and **B** are in the same direction.
c) vectors **A** and **B** are in opposite direction.
d) vectors **A** and **B** are perpendicular
e) none of the above.

Q3. If two vectors, $\mathbf{A} = 4\mathbf{i} - 5\mathbf{j}$ and $\mathbf{B} = 5\mathbf{i} + y\mathbf{j}$ are perpendicular to each other, where **i** and **j** are the unit vectors. The value of y is:

a) -4 **b)** +4 **c)** +2 **d)** -6 **e)** +3

Q4. In the following figure, the only vector that represents a summation of two vectors is:

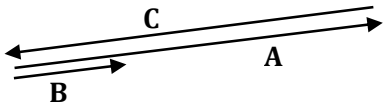


a) A **b) B** **c) C** **d)** None of the above

Q5. The two vectors $\mathbf{A} = 5\mathbf{i} + 7\mathbf{j}$ and $\mathbf{B} = -7\mathbf{i} - 9\mathbf{j}$ have a resultant vector whose magnitude and angle with positive x-axis are:

a) 2.83, 225° **b)** 4, 225° **c)** 2.83, 45° **d)** 2, 45°

Q6. The resultant vector of **A** + **B** + **C** in the figure below is equal to:



a) B **b)** C **c)** A **d)** A + B

Q7. A runner moved 3 km towards north, then 4 km towards east. After that, he headed to the point where he started and arrived there after 5 km. The displacement and distance moved by the runner are:

a) zero & 7 km **b)** 3 km & 4 km **c)** zero & 12 km **d)** 4 km & 5 km

---

Q8. A car travels 20 km due north and then 35 km in a direction 60° west of north. The magnitude of displacement of the car is:

a) 48.2 km **b)** 40.9 km **c)** 56.3 km **d)** 36.7 km **e)** 11.8 km

---

Q9. If vector **A** = 2**i** + 6**j** and vector **B** = 4**i** - 2**j**, then the magnitude of vector 2**A** + **B** is:

a) 32.1 **b)** 12.8 **c)** 14 **d)** 7.2 **e)** 22.2

Q10. If **A** + **B** = 0, the corresponding components of the two vectors **A** and **B** must be:

a) equal **b)** negative **c)** of opposite sign **d)** positive **e)** none of the above

---

Q11. Vector **A** has x and y components of -8.7 cm and 15 cm, respectively. Vector **B** has x and y components of 13.2 cm and -6.6 cm, respectively. If **A** – **B** + 3**C** = 0, the components of vector **C** are:

a) 3.2**i** & 1.1**j** **b)** -3.6**i** & 5.1**j** **c)** -6.7**i** & 4.1**j** **d)** 3.2**i** & -4.1**j** **e)** 7.3**i** & -7.2**j**

Q12. A particle undergoes the following consecutive displacements: 3.5 m south, 8.2 m north east, 15 m west. The resultant displacement and its angle with respect to east are:

a) 10.51 m, 133° **b)** 9.48 m, 166° **c)** 8.38 m, 122° **d)** 5.32 m, 66° **e)** 12.33m, 75°

Q13. A plane traveling east at 200 m/s turns and then travels south at 200 m/s. The magnitude of change in its velocity is:

a) 400 m/s **b)** 200 m/s **c)** 283 m/s **d)** 156 m/s **e)** zero

---

Q14. A vector in the xy-plane has a magnitude of 25.0 and an x-component of 12.0. The angle that it makes with the positive x-axis is:

a) 61.3^o **b)** 25.6^o **c)** 28.7^o **d)** 64.3^o **e)** 95.3^o

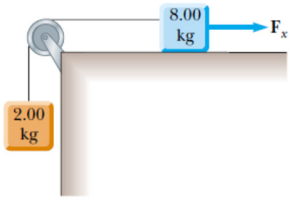
---

Q15. Consider the following three vectors: $\mathbf{A} = 2\mathbf{i} - 4\mathbf{j}$, $\mathbf{B} = 3\mathbf{j}$, $\mathbf{C} = 3\mathbf{i} + 3\mathbf{j}$. If $\mathbf{R} = 3\mathbf{A} - 2\mathbf{C} + 6\mathbf{B}$, the magnitude of R is equal to:

a) zero **b)** 1.0 **c)** 2 **d)** 3 **e)** 6

Chapter 3

Q1. In the system shown in the figure, a horizontal force $\mathbf{F}_x$ acts on the 8.00-kg object. The horizontal surface is frictionless. For what value of $\mathbf{F}_x$ does the tension on the cord = 19.6 N?



a) 23.6 N **b)** 71.6 N **c)** 46.6 N **d)** 58.8 N **e)** 39.2 N

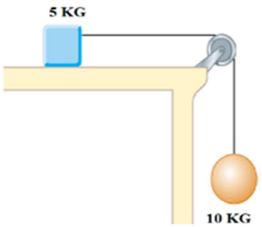
Q2. An object experiences a net force and exhibits acceleration in response. Which of the following is *always* true?

a) The object moves in the direction of force.
b) The acceleration is in the same direction as the velocity.
c) The acceleration is in the same direction as the net force.
d) The velocity of the object increases.

Q3. If a car is sliding down on an incline road of 30° above the horizontal with a constant speed, the coefficient of kinetic friction of the road is:

a) 0.88 **b)** 0.21 **c)** 0.43 **d)** 0.65 **e)** 0.58

Q4. The system in the figure starts from rest, what is the speed of the 10.00-kg ball when it has fallen to 2 m? Assume the coefficient of friction between the 5.00-kg block and the surface to be 0.5.



a) 4.42 m/s **b)** 2.42 m/s **c)** 5.2 m/s **d)** 10.2 m/s **e)** None of the above

---

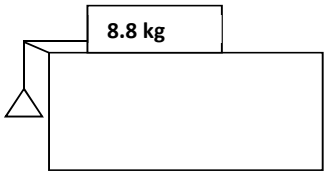
Q5. If a horizontal force of 40 N pushes a 10 kg object, the object's acceleration will be:

a) 40 m/s^2 **b)** 10 m/s^2 **c)** 4 m/s^2 **d)** 0.25 m/s^2

Q6. The acceleration of an object moving on a horizontal plane results from:

a) The reaction force.
b) The gravitational force.
c) The resultant normal force
d) The resultant force parallel to the surface.

Q7. If the mass of the hanging object = 1 kg, and friction is negligible, the acceleration of the two-mass system will be:

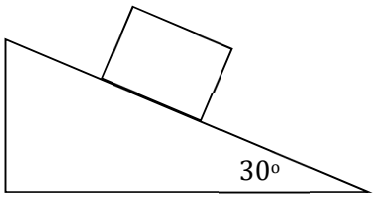


a) 0.5 m/s^2 **b)** 1.0 m/s^2 **c)** 1.5 m/s^2 **d)** 2 m/s^2

Q8. If a 1000 kg object is pushed with a force F from rest on a frictionless surface, and reaches a speed of 20 m/s after 100 m, the magnitude of F is:

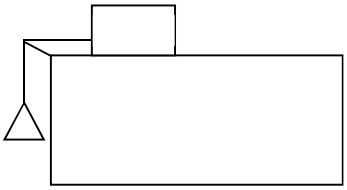
a) 50 N **b)** 100 N **c)** 2000 N **d)** 200 N

Q9. If an object slides under gravity (g = 9.8 m/s^2) on an inclined frictionless surface as shown in the figure below, its acceleration will be:



a) 6.9 m/s^2 **b)** 14.7 m/s^2 **c)** 25.5 m/s^2 **d)** 4.9 m/s^2

Q10. In the figure below, if both objects have a mass of 15 kg, with negligible friction, the acceleration of the system is:



a) 0.5 m/s^2 **b)** 1 m/s^2 **c)** 4.9 m/s^2 **d)** 1.7 m/s^2

Q11. If a body moves in a straight line with an increasing velocity, the resultant force on the body is:

a) in the same direction of movement.
b) opposite to the direction of movement.
c) zero
d) none of the above

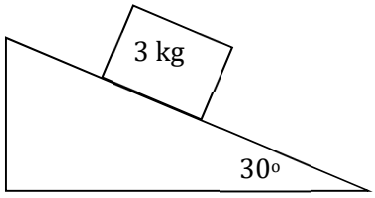
Q12. An object is accelerated by a horizontal force with acceleration of 3 m/s^2. If the object's mass is 300 kg, the force magnitude is equal to:

a) 45 N **b)** 100 N **c)** 900 N **d)** 4500 N

Q13. If an object moves towards east by a force of magnitude 100 N and direction that makes 60^o with the positive x-axis, and ignoring the frictional forces, the force component responsible for the horizontal movement of the body is:

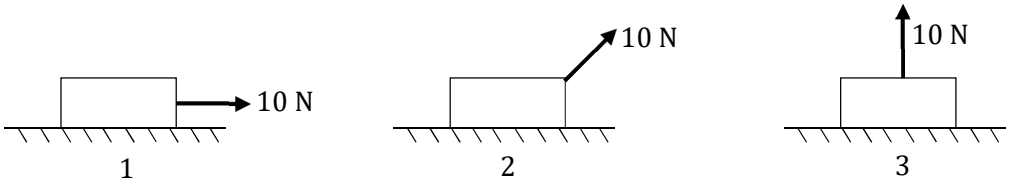
a) 50 N parallel to x-axis.
b) 87 N parallel to the y-axis.
c) 87 N parallel to the x-axis.
d) 50 N parallel to the y-axis.

Q14. Ignoring frictional forces, the object in the figure below will slide with an acceleration of:



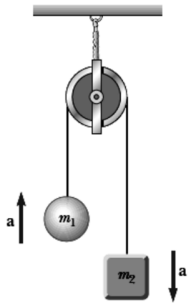
a) 8.5 m/s^2 **b)** 14.7 m/s^2 **c)** 25.5 m/s^2 **d)** 4.9 m/s^2

Q15. Rank the magnitude of the frictional force of the surface from largest to smallest in the following three situations (masses of all blocks are the same):



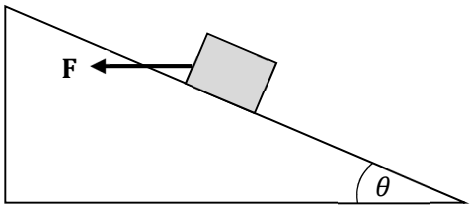
a) 3, 2, 1 **b)** All three are equal **c)** 2, 3, 1 **d)** 1, 3, 2 **e)** 1, 2, 3

Q16. In the Atwood machine shown in the figure m1 = 2 kg, m2 = 4 kg. If we ignore friction and the masses of the pulley and string, the tension in the string is:



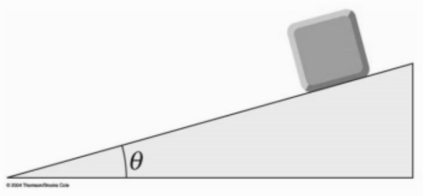
a) 45.13 N **b)** 20.54 N **c)** 39.22 N **d)** 26.13 N **e)** 29.46 N

Q17. An object of mass $m = \sqrt{3}$ kg moves along a frictionless inclined plane ($\theta = 30°$) under the influence of a force F = 10 N as shown in the figure. The acceleration of the mass is:



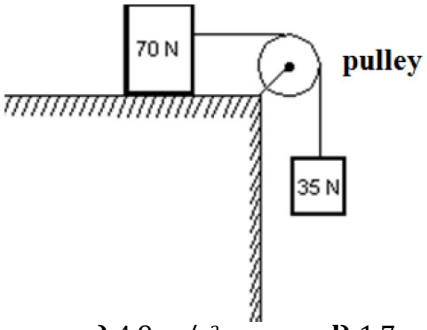
a) 0.1 m/s² **b)** 0.5 m/s² **c)** 1 m/s² **d)** 1.3 m/s² **e)** 2.2 m/s²

Q18. A 5 kg block slides down a 30° incline at a constant speed when a 21 N force is applied acting up and parallel to the incline. The coefficient of kinetic friction between the block and the surface of the incline is:



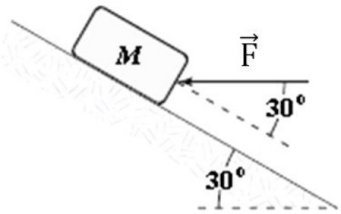
a) 0.22 **b)** 0.08 **c)** 0.45 **d)** 0.34 **e)** 0.40

Q19. A 70 N block and a 35 N block are connected by a massless string as shown in the figure below. If the pulley is massless-frictionless and the surface is frictionless, the magnitude of the acceleration of the 35-N block is



a) 9.8 m/s² **b)** 6.5 m/s² **c)** 4.9 m/s² **d)** 1.7 m/s² **e)** 3.3 m/s²

Q20. A block is pushed up a frictionless 30° incline by an applied force **F**, which is parallel to the horizontal as shown in the figure. If the magnitude of **F** is 25 N and M = 3.0 kg, what is the magnitude of the resulting acceleration of the block?



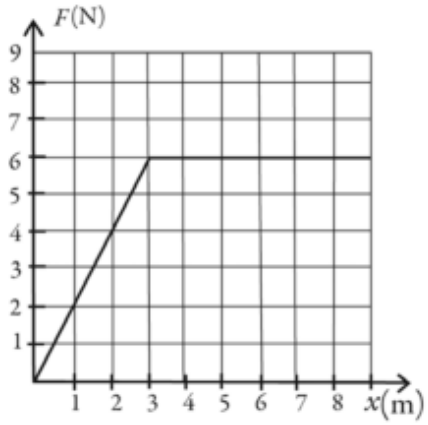
a) 6.4 m/s² **b)** 3.5 m/s² **c)** 2.3 m/s² **d)** 4.8 m/s² **e)** 5.2 m/s²

Chapter 6

Q1. Swimmers slide on two frictionless water slides as shown in the figure. Both of them drop over the same height, h; **slide 1** is straight while **slide 2** is curved. What is the relation between the final velocities v_1 and v_2?

a) $v_1 = v_2$ **b)** $v_1 > v_2$ **c)** $v_1 < v_2$ **d)** $v_1 = 2v_2$ **e)** $v_2 = 2v_1$

Q2. A graph of the force applied on an object is shown in the figure. Determine the amount of work done by this force on the object that moves from $x = 0$ to $x = 6$ m.



a) 31 Joules **b)** 19 Joules **c)** 22 Joules **d)** 35 Joules **e)** 27 Joules

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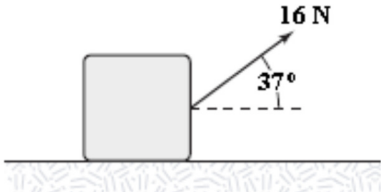
Q3. A 3 kg block is dragged over a round horizontal surface by a constant force of 16 N acting at an angle of 37° above the horizontal as shown. The speed of the block increases from 4 m/s to 6 m/s in a displacement of 5 m. The work done by the friction force during this displacement is:



a) 30 J **b)** -64 J **c)** -94 J **d)** -34 J **e)** 64 J

Q4. A child pulls a cart with a horizontal force of 77 N. If the cart moves horizontally a total distance of 42 m in 3 minutes, what is the average power generated by the child?

a) 22 W **b)** 15 W **c)** 27 W **d)** 18 W **e)** 29 W

Q5. A 75 kg man climbs the stairs to the fifth floor of a building of height 16 m. His potential energy has increased by:

a) 11.76 kJ **b)** 15.23 kJ **c)** 27.17 kJ **d)** 18.04 kJ **e)** 24.07 kJ

Q6. A boy on a bicycle traveling at 10 m/s on a horizontal road stops pedaling as he starts up a hill inclined at 3^o with respect to the horizontal. If friction forces are ignored, how far up the hill does he travel before stopping?

a) 97.4 m **b)** 81.7 m **c)** 27.3 m **d)** 32.3 m **e)** 63.4 m

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Q7. A block starts sliding from rest at the top of a frictionless incline of height 20 m and angle 20^o. At the bottom of the incline, the block encounters a horizontal surface where the coefficient of kinetic friction between the block and the ground is 0.21. How far does the block travel on the horizontal surface before coming to rest?

a) 82.1 m **b)** 95.2 m **c)** 101.4 m **d)** 78.7 m **e)** 113.3 m

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Q8. An older model car of mass m accelerates from rest to speed v in 10 seconds. A newer sports car of mass m accelerates from rest to $2v$ in the same time period. The ratio of the power of newer car to that of the older car ($P_{\text{new car}}/P_{\text{older car}}$)

a) 0.25 **b)** 0.5 **c)** 1.0 **d)** 2 **e)** 4

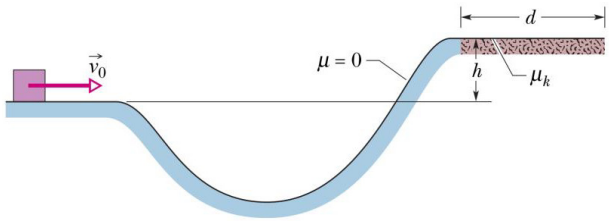
Q9. A 150 kg motorcycle is traveling at 10 m/s along a horizontal road. When the brakes are applied, the car skids (slides) to a stop in 5.0 s. Find the magnitude of work done on the car.

a) 300 J **b)** 500 J **c)** 750 J **d)** 7500 J **e)** 15000 J

Q10. The power it takes to lift a 1000 N load for 10 m in 20 s is:

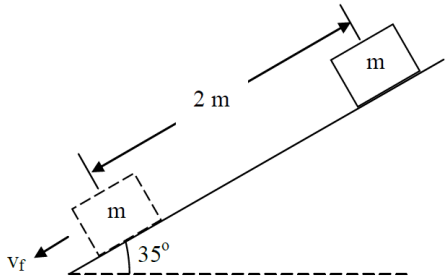
a) 5 W **b)** 500 W **c)** 2000 W **d)** 20000 W **e)** 5000 W

Q11. In the figure below, a block slides along a track from one level to a higher level after passing through a valley. The track is frictionless until the block reaches the higher level. On the rough surface, a frictional force stops the block in a distance d. The block's initial speed v_0 is 6.0 m/s, the height difference h is 1.1 m, and μ_k is 0.60. Find d.



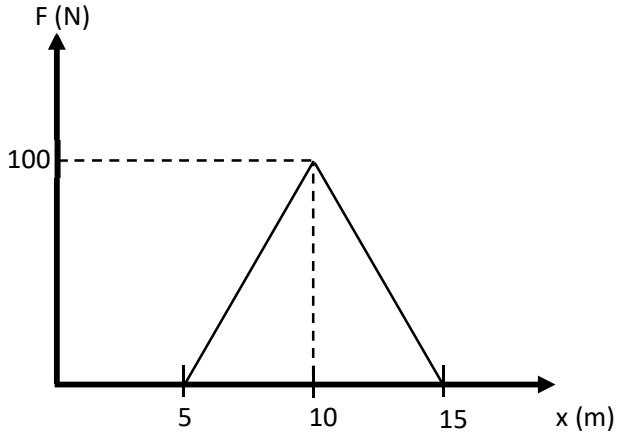
a) 1.2 m **b)** 2.6 m **c)** 3.4 m **d)** 4.5 m **e)** 5.7 m

Q12. A 3.0 kg block starts from rest on a rough inclined plane that makes an angle of 35° with the horizontal as shown in the figure. As the block moves 2.0 m down the incline, its speed is 4.0 m/s. Find the value of the coefficient of kinetic friction between the block and the incline.



a) 0.1 **b)** 0.2 **c)** 0.3 **d)** 0.4 **e)** 0.8

Q13. A 5-kg object at rest is subjected to a force **F**. The variation of the force **F** as a function of position x is shown in the figure below. Calculate the velocity of the object after the time interval the force is applied.



a) 10 m/s **b)** 14.1 m/s **c)** 200 m/s **d)** 500 m/s **e)** 1500 m/s

Q14. In the figure, the ball's velocity is 6 m/s, and the height of the ramp is 1m. Ignoring friction, the ball's velocity at the top of the ramp is:

a) -2 m/s **b)** 3 m/s **c)** 5 m/s **d)** 4 m/s

e) The ball won't make it to the top of the ramp.

Q15. An electron is accelerated from rest in an electron gun to an energy of 2.5×10^{-18} J over a distance of 2.5 cm. The force acting on the electron is:

a) 1.6×10^{-16} N **b)** 2×10^{-18} N **c)** 2.5×10^{-14} N **d)** 10^{-16} N **e)** 1.2×10^{-15} N

Q16. A ball rolls down on an inclined surface starting at 3.77 m/s. At the bottom of the slope its speed is 14.4 m/s. The height (in m) of the slope is:

a) 9.85 m **b)** 4.76 m **c)** 2.90 m **d)** 7.21 m **e)** 10.65 m

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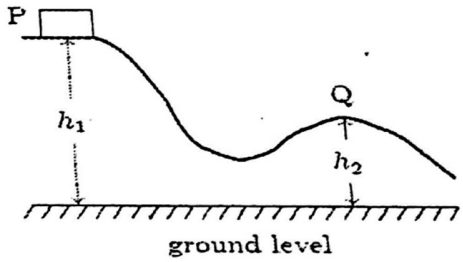
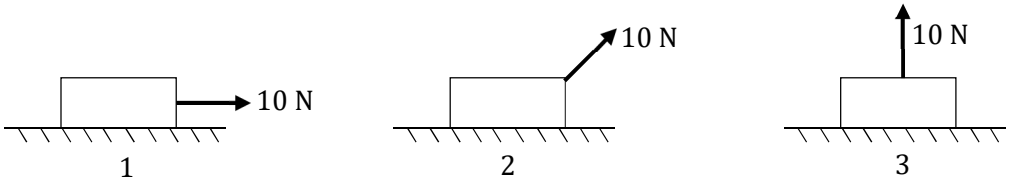
Q17. A block is released from rest at point P and slides along the frictionless track shown. At point Q, its speed is:



a) $2g\sqrt{h_1 - h_2}$ **b)** $2g(h_1 - h_2)$ **c)** $\sqrt{2g(h_1 - h_2)}$ **d)** $(h_1 - h_2)/2g$ **e)** $\frac{2}{2g}(h_1 - h_2)$

Q18. A crate moves 10m to the right on a horizontal surface as a woman pulls on it with a 10 N force. Rank the situations shown below according to the work done by her force, least to greatest:



a) 1, 2, 3 **b)** 3, 2, 1 **c)** 2, 3, 1 **d)** 1, 3, 2 **e)** 2, 1, 3

Q19. Approximately 6 x 104 kg of water falls down each minute from a height of 100 m. If one half of the gravitational energy of water were converted to electrical energy, the power generated is:

a) 9.8×10^4 W **b)** 4.5×10^4 W **c)** 1×10^4 W **d)** 3.9×10^4 W **e)** 4.9×10^4 W

Q20. A 60 kg man runs up a flight of stairs 6 m high in 2 seconds. The average power in Watt done by the gravity force is:

a) 2100 **b)** 2700 **c)** 3000 **d)** 1764 **e)** 3500