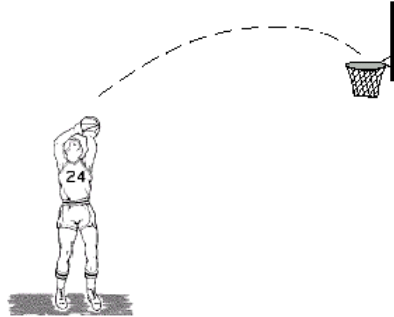
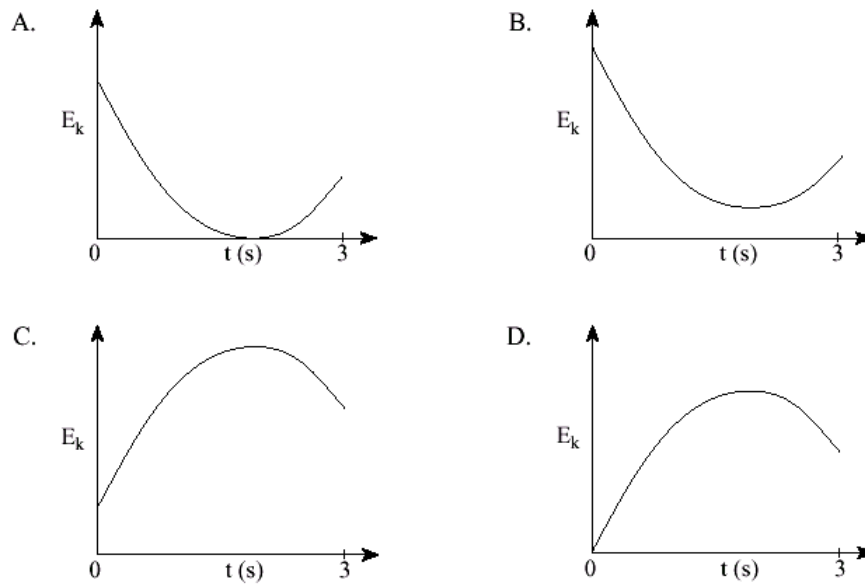


Physics 12
Unit 3A Provincial Package

1. A basketball is thrown into the basket, as shown in the diagram below. The ball leaves the player's hand at $t = 0$ s and reaches the basket at $t = 3$ s.



Which of the following graphs **best** represents the ball's kinetic energy E_k as a function of time?



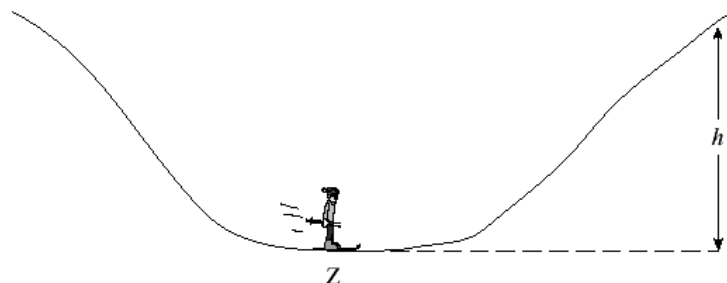
2. How much work must be done to stop an 1 800 kg vehicle travelling at 30 m/s?

- A. 1.8×10^4 J
B. 5.4×10^4 J
C. 5.3×10^5 J
D. 8.1×10^5 J

3. Work is measured in which units?

- A. J
B. N
C. J/s
D. $\text{N} \cdot \text{s}$

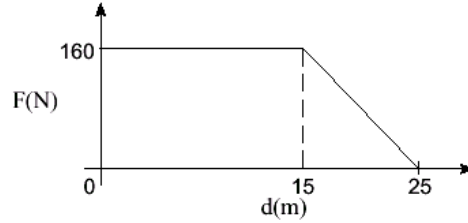
4. What is the minimum power developed by a 75 kg person who climbs a set of stairs 4.5 m high in 5.0 s?
- 6.8×10^1 W
 - 6.6×10^2 W
 - 1.7×10^3 W
 - 3.3×10^3 W
5. A 3.5 kg projectile was launched vertically at 75 m/s. The projectile reached a maximum height of 180 m. How much energy was lost to heat while the projectile was rising?
- 0 J
 - 3.7×10^3 J
 - 6.2×10^3 J
 - 9.8×10^3 J
6. As a skier descends a slope, her kinetic energy increases from 600 J to 3 200 J while her gravitational potential energy decreases by 5 900 J. How much heat energy is created due to friction?
- 2 100 J
 - 3 300 J
 - 8 500 J
 - 9 700 J
7. Calculate the minimum power of a cyclist who can increase his kinetic energy from 480 J to 2 430 J by travelling 26 m in 4.0 s.
- 75 W
 - 3.6×10^2 W
 - 4.9×10^2 W
 - 7.3×10^2 W
8. The 2.0 kg head of an axe strikes a tree horizontally at 40 m/s. The blade penetrates 0.040 m into the tree. What is the average force exerted by the blade on this tree?
- 2.0×10^1 N
 - 2.0×10^3 N
 - 2.0×10^4 N
 - 4.0×10^4 N
9. René, whose mass is 85 kg, skis down the hill, passing Z with a kinetic energy of 9 700 J.



If friction is ignored, to what maximum height, h , can René ski?

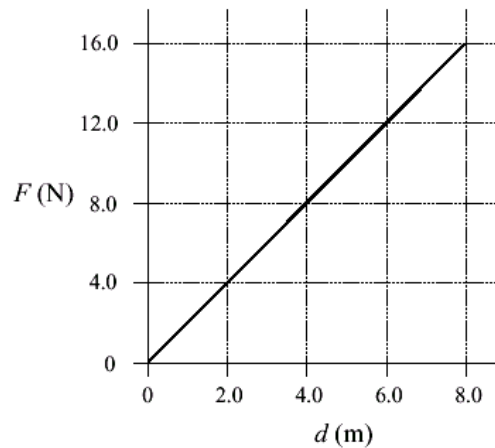
- 12 m
- 15 m
- 1.1×10^2 m
- 6.6×10^2 m

10. A cyclist travelling at 10 m/s applies her brakes and stops in 25 m. The graph shows the magnitude of the braking force versus the distance travelled.



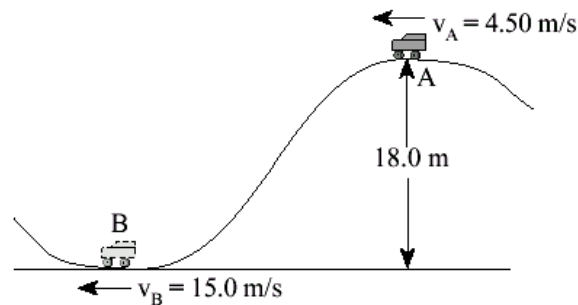
What is the total mass of bike and cyclist?

- A. 20 kg
 B. 40 kg
 C. 64 kg
 D. 80 kg
11. The graph below shows the relationship between the force applied and the distance moved for a 3.5 kg object on a frictionless horizontal surface.

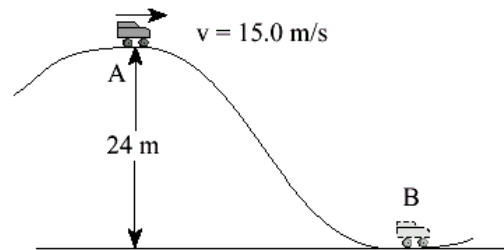


If the object was initially at rest, what is its kinetic energy after travelling 8.0 m?

- A. 2.0 J
 B. 32 J
 C. 64 J
 D. 130 J
12. A 250 kg roller coaster car travels past points A and B with speeds shown in the diagram below. How much heat energy is produced between these points? **(7 marks)**

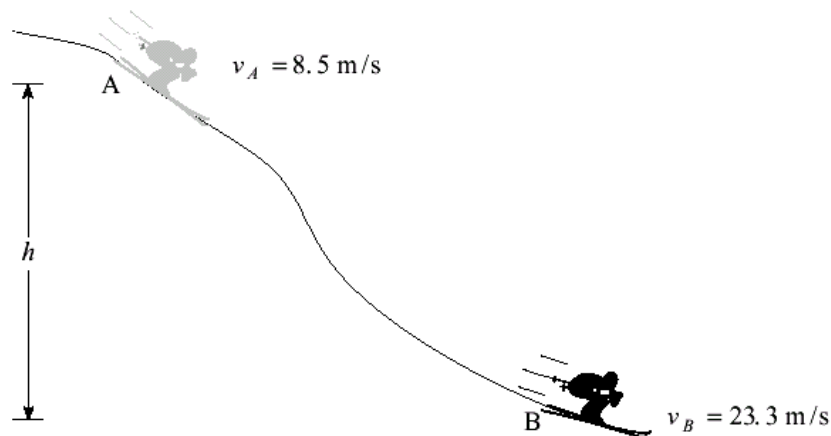


13. A 150 kg roller coaster car passes the crest of a hill at 15.0 m/s.

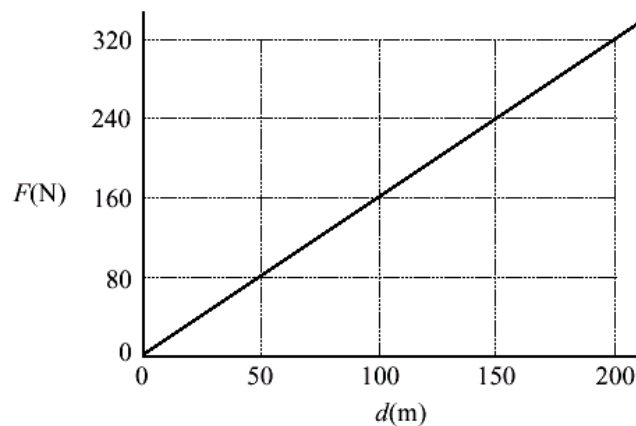


- a) What is the speed of the car at point **B** at the bottom of the hill? (Neglect friction.)(5 marks)
- b) i) If the mass of the roller coaster car is increased by adding a passenger, how will the speed at **B** now compare to your answer for part a)? (Circle one.) (1 mark)
- A. equal to
B. less than
C. greater than
- ii) Explain your answer using principles of physics. (3 marks)

14. As a 62 kg skier descends from **A** to **B** her velocity increases from 8.5 m/s to 23.3 m/s. Friction between **A** and **B** generates 8 700 J of heat energy. Through what vertical height, h , did the skier descend? (7 marks)



15. A 24 kg rocket car is initially at rest on a frictionless horizontal surface. The engine is ignited and the graph below shows thrust force, F , versus distance travelled, d , for the rocket car. Find the rocket car's speed after it has travelled 200 m. (7 marks)



KEY

- 1. B
- 2. D
- 3. A
- 4. B

- 5. B
- 6. B
- 7. C
- 8. D

- 9. A
- 10. C
- 11. C

12. 18500 J

13. a) 26.4 m/s

b) i) A equal to

ii) The speed will be the same as in a). This is a direct transfer of potential energy to kinetic energy. Both potential energy and kinetic energy have the mass term in them. If you increase the mass, both potential energy and kinetic energy increase by the same amount.

14. 38.3 m

15. 51.6 m/s