Work and Kinetic Energy
Concept Questions

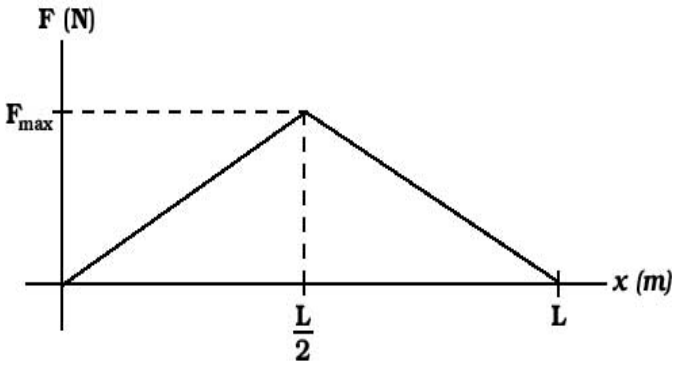
Question 1 Work and Kinetic Energy

Compared to the amount of energy required to accelerate a car from rest to 10 miles per hour, the amount of energy required to accelerate the same car from 10 mph to 20 mph is

1. the same
2. twice as much
3. three times as much
4. four times as much
5. unsure.

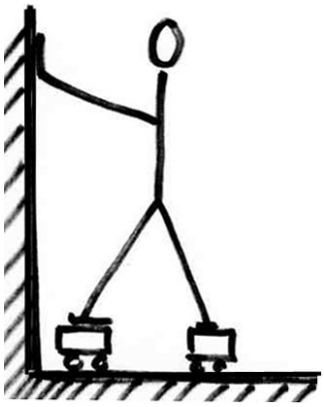
Question 2 Work and variable force

A particle starts from rest at $x = 0$ and moves to $x = L$ under the action of a variable force $F(x)$, which is shown in the figure. What is the particle's kinetic energy at $x = L/2$ and at $x = L$?



1. $F_{\max} L/2, F_{\max} L$
2. $F_{\max} L/4, 0$
3. $F_{\max} L, 0$
4. $F_{\max} L/4, F_{\max} L/2$
5. $F_{\max} L/2, F_{\max} L/4$

Question 3: Pushing Against a Wall



The work done by the contact force of a wall on a person as the person moves is

1. positive.
2. Negative.
3. zero.
4. Impossible to determine from the information given in the question and the figure.

Question 4

You lift a 10 kg weight that was resting on the ground to a height of 2 m above the ground, and then hold it there at rest. How much work do you do on the weight in moving it (take $g = 10\ \mathrm{m \cdot s^{-2}}$)?

1) -200 N m

2) greater than -200 N m but less than 0 because the work changes sign part way through.

3) You do no work because the weight begins and ends at rest.

4) greater than 0 but less than 200 N m because the work changes sign part way through

5) 200 N m

6) None of the above.

Question 5 The same horizontal force, of magnitude F, is applied to two different blocks, of mass m and $3m$ respectively. The blocks move on a frictionless surface and both blocks begin from rest.

(a) If the force is applied for the same time to each block, which one of the following sentences is true?

(i) The heavier block acquires 9 times as much kinetic energy as the lighter block.

(ii) The heavier block acquires 3 times as much kinetic energy as the lighter block.

(iii) The two blocks acquire the same kinetic energy.

(iv) The lighter block acquires 3 times as much kinetic energy as the heavier block.

(v) The lighter block acquires 9 times as much kinetic energy as the heavier block.

Question 6 The same horizontal force, of magnitude F, is applied to two different blocks, of mass m and $3m$ respectively. The blocks move on a frictionless surface and both blocks begin from rest. If each block moves the same distance as the force is applied, which one of the following sentences is true?

(i) The heavier block acquires 9 times as much kinetic energy as the lighter block.

(ii) The heavier block acquires 3 times as much kinetic energy as the lighter block.

(iii) The two blocks acquire the same kinetic energy.

(iv) The lighter block acquires 3 times as much kinetic energy as the heavier block.

(v) The lighter block acquires 9 times as much kinetic energy as the heavier block.

Question 7 The same horizontal force, of magnitude F, is applied to two different blocks, of mass m and $3m$ respectively. The blocks move on a frictionless surface and both blocks begin from rest. If the force is applied to each block until they reach the same speed v_0, which one of the following sentences is true?

(i) The force is applied to the heavier block 9 times longer than the lighter block.

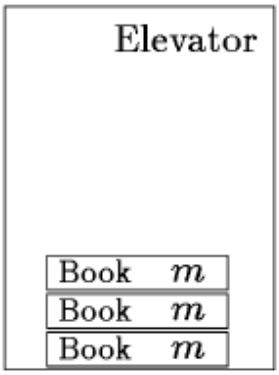
(ii) The force is applied to the heavier block 3 times longer than the lighter block.

(iii) The force is applied to the two blocks for the same amount of time.

(iv) The force is applied to the lighter block 3 times longer than the heavier block.

(v) The force is applied to the lighter block 9 times longer than the heavier block.

Question 8 Three books, each of mass m, rest on the floor of an elevator. The elevator starts at the first floor and rises to the sixth floor. It travels at a constant speed between the second and fifth floors, as it rises by a total distance h. This problem focuses on the work W done on the **middle book** by all forces (conservative or non-conservative) during the passage from the second to the fifth floors. In the following display, circle the correct entry in each row:



Total work W =	$-3mgh$	$-2mgh$	$-mgh$	**0**	mgh	$2mgh$	$3mgh$
Work done by gravity =	$-3mgh$	$-2mgh$	**$-mgh$**	0	mgh	$2mgh$	$3mgh$
Work done by elevator floor =	$-3mgh$	$-2mgh$	$-mgh$	**0**	mgh	$2mgh$	$3mgh$
Work done by book below =	$-3mgh$	$-2mgh$	$-mgh$	0	mgh	**$2mgh$**	$3mgh$
Work done by book above =	$-3mgh$	$-2mgh$	**$-mgh$**	0	mgh	$2mgh$	$3mgh$
Work done by book on itself =	$-3mgh$	$-2mgh$	$-mgh$	**0**	mgh	$2mgh$	$3mgh$

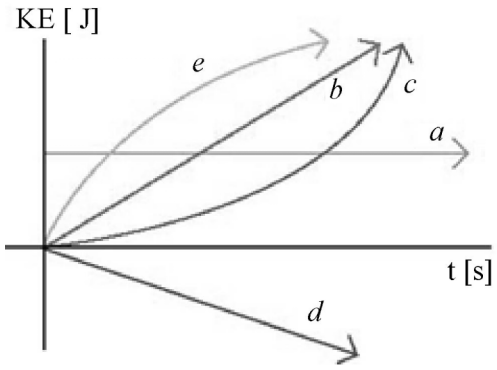
Question 9 When a person walks, the force of friction between the floor and the person's feet accelerates the person forward. The floor does

1. Positive work on the person.

2. Negative work on the person.

3. No work on the person.

Question 10 An object is dropped to the earth from a height of 10m. Which of the following graphs of kinetic energy vs. time best represent the kinetic energy of the object as it approaches the earth (neglect friction).



1. a
2. b
3. c
4. d
5. e

8.01SC Physics I: Classical Mechanics