

1) A car traveling at 100 km/hr strikes an unfortunate bug and splatters it. The force of impact is

- A) greater on the bug
- B) greater on the car
- C) the same for both

2) Two objects have the same size and shape, but one is much heavier than the other. When they are dropped simultaneously from a tower, they reach the ground at the same time, but the heavier one has a greater

- A) momentum.
- B) acceleration.
- C) speed.
- D) all of these
- E) none of these

3) When you jump from an elevated position you usually bend your knees upon reaching the ground. By doing this, you make the time of the impact about 10 times as great as for a stiff-legged landing. In this way the average force your body experiences is

- A) about 10 times as great.
- B) about 1/10 as great.
- C) less than 1/10 as great.
- D) more than 1/10 as great.

4) A 1-kg chunk of putty moving at 2 m/s collides with and sticks to a 3-kg bowling ball initially at rest. The bowling ball and putty then move with a speed of

- A) 0 m/s.
- B) 0.5 m/s.
- C) 1 m/s.
- D) 2 m/s.
- E) none of the above

5) An astronaut, floating alone in outer space, throws a baseball. If the ball floats away at a speed of 20 meters per second, the astronaut will

- A) move in the opposite direction, but at a lower speed.
- B) move in the opposite direction but at a higher speed.
- C) move in the opposite direction at a speed of 20 m/s.
- D) not move as stated in any of the above choices.

6) After rolling halfway down an incline a marble's kinetic energy is

- A) the same as its potential energy.
- B) greater than its potential energy.
- C) less than its potential energy.
- D) impossible to determine.

7) An object is projected into the air with 100J of kinetic energy. When it returns to its original level after encountering air resistance, its kinetic energy is

- A) less than 100 J
- B) more than 100 J
- C) 100 J
- D) need more information

8) A car moving at 50 km/hr skids 20 m with locked brakes. How far will the car skid with locked brakes if it were traveling at 150 km/hr?

- A) 180 m
- B) 20 m
- C) 60 m
- D) 90m
- E) 120 m

9) A diver who weighs 400 N steps off a diving board that is 10m above the water. The diver hits the water with a kinetic energy of

- A) 10 J
- B) 400 J.
- C) 410 J.
- D) 4000 J
- E) more than 4000 J

10) A child in a boat hurls a ball forward, resulting in the boat moving backwards. This can be explained best by

- A) energy conservation
- B) momentum conservation
- C) Newton's first law
- D) kinetic versus potential energy
- E) mechanical equilibrium

11) If several balls of different masses are thrown up with the same initial velocity, the quantity that will have the same value for each ball is

- A) momentum

- B) energy
- C) acceleration
- D) impulse imparted upon striking the ground

12) Horses that move with the fastest linear speed on a merry-go-round are located

- A) near the center
- B) near the outside
- C) anywhere, because they all rotate at the same speed.

13) Doorknobs are placed far from the hinge rather than in the middle of the door,

- A) to minimize the torque for a given force applied to open the door
- B) to maximize the torque for a given force
- C) to maximize the force for a given torque
- D) none of the above

14) When a twirling ice skater brings his arms inward, his rotational speed

- A) remains the same.
- B) increases.
- C) decreases.
- D) becomes zero

15) Why does a hiker with a heavy backpack lean forward when standing or walking?

- A) to reposition the center of mass (of herself plus the backpack) directly over her feet
- B) to lower her center of mass
- C) to increase the torque about her center of mass
- D) to improve her posture

16) A ring and a disk, initially at rest, roll down a hill together. The one to reach the bottom first is

- A) the ring
- B) the disk
- C) depends on their sizes
- D) depends on their masses
- E) both reach at the same time

17) Consider two planets in space. If the masses of both planets are halved, and the

distance between them is also halved, then the gravitational force between them is

- A) four times as much.
- B) twice as much.
- C) unaltered.
- D) half as much.
- E) quartered.

18) What is the force of gravity on an astronaut in a space shuttle orbiting the Earth at about 160km?

- A) about half as much as it would be if she was on the ground
- B) almost the same as on the ground
- C) almost zero
- D) exactly zero

19) During an eclipse of the sun, the sun, moon and earth are in alignment, and the high ocean tides on earth are then

- A) extra high
- B) extra low
- C) not particularly different than at any other time