Exam 2--PHYS 101-F08

Multiple Choice
Identify the choice that best completes the statement or answers the question.

____ 1. You put your book on the seat next to you. When the bus stops, the book slides off. Why?
   a. the book remained stationary
   b. gravity was acting on the book
   c. it did not move, but seemed to
   d. no net force acted on the book
   e. a net force did act on the book

____ 2. From rest, you step on the accelerator of your Subaru providing a force $F$ for 6.0 seconds, after which your car is traveling at 10. m/s. If the applied force was only $\frac{1}{3}F$, what time is required to reach the same velocity?
   a. 2.0 s
   b. 20. s
   c. 3.3 s
   d. 18 s

____ 3. What can you say about the force of gravity ($F_g$) acting on a feather or a stone?
   a. $F_g$ is the same for both
   b. $F_g$ is zero for both
   c. $F_g$ is greater for the feather
   d. $F_g$ is greater for the stone

____ 4. Antilock breaks keep the car wheels from locking up when you stop your car. Why does this help slow the car down?
   a. $\mu_s > \mu_k$ so static friction is better
   b. $\mu_s > \mu_k$ so sliding friction is better
   c. $\mu_s > \mu_k$ so sliding friction is better
   d. $\mu_k > \mu_s$ so static friction is better

____ 5. This figure shows a block suspended by two ropes. The ropes are attached to the ceiling at an angle of 45°. If the weight of the block is 100 N, what is the tension in the rope on the left?
   a. 70 N
   b. 140
   c. 50 N
   d. 100 N
   e. 40 N
6. You step on the accelerator of your car and, in 10 seconds, increase the speed from 10 m/s to 30 m/s. What force is exerted on the car to produce this acceleration? Assume the mass of the car is 1000 kg.

a. 500 N  
   b. 2000 N  
   c. 10,000 N  
   d. 20,000 N

7. This figure shows an elevator with a mass of 10.0 kg suspended from a rope within it. The elevator is accelerating downwards at a rate of 2.0 m/s^2. What is the tension of the rope that is holding the block up?

a. 118 N  
   b. 98 N  
   c. 20 N  
   d. 78 N  
   e. 5 N

8. A 100 kg crate sits on the floor. In order to set the crate in motion, a horizontal force of, at least, 100 N must be exerted on the crate. Then, the crate can be pushed, at a constant velocity, with a force of 80 N. What is the coefficient of static friction between the crate and the floor?

a. 0.2  
   b. 0.1  
   c. 0.08  
   d. 1.0  
   e. 0.8
9. A block of mass m rests on the floor of an elevator that is falling downward at -9.8 m/s² (it is in freefall). What is the relationship between the force due to gravity (mg) and the normal force (N) on the block?
   a. N=mg
d. N=0  
b. N>mg
e. depends on the speed of the elevator  
c. N<mg

10. In this figure, the block has a mass of 10 kg and sits on an incline plane with an angle θ=30°. What is the minimum force \( \vec{F} \) so that the block remains in place. Assume that friction is negligible.

   a. 100 N  
   b. 49 N  
   c. 25 N  
   d. 510 N  
   e. 85 N

11. A mass of 1 kg is on the planet Mars. The radius of the planet Mars is 3.4x10⁶ m, and its mass is 6.4x10²³ kg. What acceleration due to gravity does the mass feel on this planet? (The Gravitational constant is 6.67x10⁻¹¹ m³/(kg s²)).

   a. 4.5 m/s²  
   b. 3.7 m/s²  
   c. 9.8 m/s²  
   d. 1.6 m/s²
12. By what factor does the kinetic energy of a car change if its velocity is tripled?
   
   a. 1  
   b. 3  
   c. 9  
   d. 6  
   e. 12

13. You drop two stones from the same height. One stone has twice the weight of the other stone. When they reach the ground, which stone has more kinetic energy & why?
   
   a. the lighter stone, because it has a higher velocity  
   b. the heavier stone, because it has more mass  
   c. the lighter stone, because its force due to gravity is less  
   d. the heavier stone, because it is going faster  
   e. both have the same KE, because both have the same velocity

14. In this figure, the bead has a mass of 1.00 kg and, at point A, has a velocity of 10.0 m/s. It goes down the slope. What is its velocity at point B?
   
   a. 49.0 m/s  
   b. 14.1 m/s  
   c. 7.67 m/s  
   d. 9.9 m/s
15. A block of mass 1.0 kg is attached to a spring with a spring constant 1200 N/m. The spring is compressed by 20 cm, as shown in this figure, and then released. What is the velocity of the block when it passes through the equilibrium (x=0 cm) position of the spring?

- 15. A block of mass 1.0 kg is attached to a spring with a spring constant 1200 N/m. The spring is compressed by 20 cm, as shown in this figure, and then released. What is the velocity of the block when it passes through the equilibrium (x=0 cm) position of the spring?

![Diagram of a block attached to a spring, with x=-20 cm and x=0 cm marked.]

a. 48 m/s  
   b. 6.9 m/s  
   c. 240 m/s  
   d. Not enough information given

16. For the spring in the previous problem, what is the force exerted by the spring on the block when the spring is compressed to x=-20 cm?

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a. 6000 N  
   b. 240 N  
   c. 48 N  
   d. -240 N

17. Entergy reads kilowatt-hours from our electric meters. What is this a measure of?

- 17. Entergy reads kilowatt-hours from our electric meters. What is this a measure of?

a. energy  
   b. power  
   c. flow of electricity  
   d. force

18. An outfielder throws a 0.2 kg baseball with a velocity of 35 m/s at an angle of 30.0°. At the top of the ball’s trajectory, what is its kinetic energy?

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a. 110 J  
   b. 2.6 J  
   c. 92 J  
   d. 123 J

19. A car starts from rest and accelerates to 50 miles per hour (mph). Later it gets on the highway and accelerates to 100 mph. Which takes more energy: accelerating from 0⇒50 mph or 50⇒100 mph?

- 19. A car starts from rest and accelerates to 50 miles per hour (mph). Later it gets on the highway and accelerates to 100 mph. Which takes more energy: accelerating from 0⇒50 mph or 50⇒100 mph?

a. both the same  
   b. 0⇒50 mph  
   c. 50⇒100 mph

5
20. A uranium nucleus is at rest and undergoes fission and splits into two fragments, one heavy and one light. Which of these statements is true?

- the lighter and heavier fragments have the same momentum (but in opposite directions)
- the lighter and heavier fragments have the same velocity (but in opposite directions)
- the heavier fragment has a higher velocity than the light one
- the lighter fragment has more momentum than the heavy one

21. Which of these is best approximated as an elastic collision?

I. Collision of two cars
II. Collision between particles of gas
III. Collision between baseball & bat

- II
- I
- None of these
- II & III
- I & III

22. Peter Lafleur (80 kg) and White Goodman (80 kg) face off in Sudden Death dodgeball match. Peter throws his dodgeball, which has mass 0.5 kg, with a velocity of 5 m/s and strikes Goodman in the head. The ball comes to rest. What is White Goodman’s speed after being struck by the ball?

- 0.5 m/s
- 2 m/s
- 5 m/s
- 0.03 m/s
23. A collection of particles has a total momentum of zero. What can we say about the kinetic energy of the system?
   a. the KE is positive  
   b. the KE is zero  
   c. the KE is negative  
   d. the KE is either positive or negative, but not zero  
   e. not enough information

24. A cart is rolling along a frictionless track. Rain is falling into the cart. What happens to the speed of the cart? (assume the rain falls vertically into the cart)
   a. increases  
   b. stays the same  
   c. decreases  
   d. not enough information

25. A car of mass 1000 kg is traveling at 20.0 m/s and collides into a brick wall. The car rebounds at a speed of 5.0 m/s. The collision occurs in 0.10 seconds. What is the magnitude of the force on the car during the collision?
   a. 15,000 N  
   b. 150,000 N  
   c. 2,500 N  
   d. 250,000 N

26. Which would hurt more: a 0.5 kg ball hits you and bounces off or a 0.5 kg ball hits you and falls directly to the floor?
   a. the ball that bounces  
   b. the ball that falls  
   c. both would hurt the same (a lot)  
   d. not enough information

27. The correct answer to this question is “A.”
   a. A  
   b. B  
   c. C  
   d. D
Exam 2--PHYS 101-F08
Answer Section

MULTIPLE CHOICE

1. ANS: D PTS: 1
2. ANS: D PTS: 1
3. ANS: D PTS: 1
4. ANS: A PTS: 1
5. ANS: A PTS: 1
6. ANS: B PTS: 1
7. ANS: D PTS: 1
8. ANS: B PTS: 1
9. ANS: D
   CT
   PTS: 1
10. ANS: B
    HW,diff
    PTS: 1
11. ANS: B PTS: 1
12. ANS: C PTS: 1
13. ANS: B PTS: 1
14. ANS: B PTS: 1
15. ANS: B PTS: 1
16. ANS: B PTS: 1
17. ANS: A PTS: 1
18. ANS: C PTS: 1
19. ANS: C PTS: 1
20. ANS: A PTS: 1
21. ANS: A PTS: 1
22. ANS: D PTS: 1
23. ANS: E PTS: 1
24. ANS: C PTS: 1
25. ANS: D PTS: 1
26. ANS: A PTS: 1
27. ANS: A PTS: 1