

29:006 Spring 2011 — PRACTICE EXAM 1

We will go over this exam in class on Monday February 14
(The actual exam will have 30 questions)

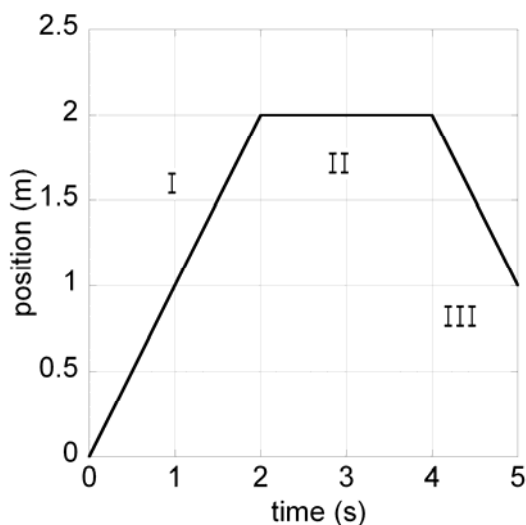
1. A 5 kg rock is dropped from rest from a great height. Ignore air resistance. How far has it fallen and what is its velocity 2 seconds after it is dropped?
 (A) 15 m, 30 m/s (B) 30 m, 45 m/s
 (C) 45 m, 30 m/s (D) 20 m, 20 m/s

2. An elevator is moving up, and accelerating. Which of the following is true?
 (A) The elevator's velocity is up, and its acceleration is up.
 (B) The elevator's velocity is up, and its acceleration is down.
 (C) The elevator's velocity is down, and its acceleration is up.
 (D) The elevator's velocity is down, and its acceleration is down

3. A car moving at 58 m/s begins accelerating at 6 m/s^2 . When will it reach 100 m/s?
 (A) 7 s (B) 6s (C) 5 s (D) 8 s

4. A cart of mass 4.0 kg has two horizontal forces acting on it: a 60 N force to the right and a 40 N force to the left. What is the cart's acceleration?
 (A) 5 m/s^2 to the right, (B) 5 m/s^2 to the left
 (C) 15 m/s^2 to the right (D) 10 m/s^2 to the left

5. A position vs. time plot of an object is shown below. What is the speed (in m/s) of the object in the intervals I, II and III?

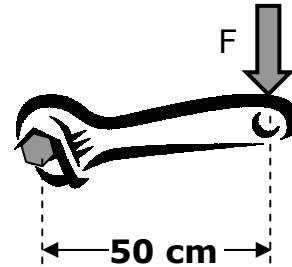


	I	II	III
(A)	2	2	1
(B)	1	1	2
(C)	1	0	2
(D)	1	0	1

6. Which of the following statements is correct?
- (A) it is harder to get an object moving than to keep it moving because sliding friction is larger than static friction.
 - (B) it is harder to get an object moving than to keep it moving because sliding friction is smaller than static friction.
 - (C) it requires the same force to start an object moving and to keep it moving
 - (D) even if there is no friction you must keep pushing on an object to keep it moving with a constant velocity
7. Which of the following are true concerning mass and weight?
- (A) they are the same
 - (B) they both depend on what planet you are on
 - (C) weight does not depend on gravity, but mass depends on gravity
 - (D) mass is independent of gravity, but weight depends on gravity
8. You are bouncing up and down on a spring board, preparing to dive into the pool. While you are in the air above the board, your acceleration is
- (A) zero because you are not touching anything.
 - (B) upward and constant until you reach the peak, then it becomes downward and constant.
 - (C) downward and constant.
 - (D) initially upward but it gradually diminishes to zero as you reach the peak and then it gradually becomes more and more downward.
9. The three laws of mechanics are named in honor of
- (A) Newton
 - (B) Galileo
 - (C) Kepler
 - (D) Einstein
10. Which of Newton's Laws is most useful for understanding collisions?
- (A) 1st
 - (B) 2nd
 - (C) 3rd
11. Which of these are the same as 9,456,920,000, 0.000000007690, and 1.240×10^{-4} ?
- | | | | |
|-----|---------------------------|-------------------------|-----------|
| (A) | 9.456920000×10^9 | 7.690×10^{-9} | 0.000124 |
| (B) | 9.456920000×10^9 | 7.690×10^{-10} | 0.00124 |
| (C) | 9.456920000×10^8 | 7.690×10^{-9} | 0.000124 |
| (D) | 9.456920000×10^8 | 7.690×10^{-10} | 0.0001240 |
12. After clearing the bar in the high jump, you land softly on a giant mattress. Landing on the mattress is much more comfortable than landing on a sand heap of equal size because
- (A) you transfer less momentum to the mattress in coming to a stop than you would have transferred to the sand heap in coming to a stop.
 - (B) the force that the mattress exerts on you to stop your descent is much less than the force that the sand heap would have exerted on you.
 - (C) you transfer more momentum to the mattress in coming to a stop than you would have transferred to the sand heap in coming to a stop.
 - (D) your velocity is less as you land on the mattress than it would have been if you had landed on the sand heap.

13. Two cars collide on a frictionless air track. Car A has a mass $m_A = 2$ kg and is initially moving at $v_A = 12$ m/s. Car B has a mass $m_B = 4$ kg and is initially at rest. After the cars collide they stick together. What is the speed of the combination after they collide and stick together?
(A) 3 m/s (B) 4 m/s (C) 6 m/s (D) 12 m/s
14. A chain is hanging from your rearview mirror. If the chain swings backward away from the car's windshield while the car is on a level road, you know that the car is
(A) accelerating backward.
(B) accelerating forward.
(C) traveling backward at a steady pace.
(D) traveling forward at a steady pace
15. How much upward velocity must a ball have to reach a maximum height of 5 m?
(A) 10 m/s (B) 100 m/s (C) 50 m/s (D) 20 m/s
16. A 3 kg mass moves in a circle of radius 5 meters at a constant speed of 10 m/s. What is the centripetal force on this mass?
(A) 20 N (B) 60 N (C) 50 N (D) 30 N
17. What is the direction of the centripetal force on the mass in problem 16?
(A) in the direction outward from the center of the circle
(B) in the same direction as the velocity
(C) in the direction opposite to the velocity
(D) in the direction inward toward the center of the circle
18. A table cloth is pulled out from under the dishes without disturbing the dishes. The principle in operation here is
(A) Newton's 1st law (B) Newton's 2nd law
(C) Newton's 3rd law (D) Newton's law of gravity
19. On a frictionless air track a car is released from rest from one end. Two seconds later it is observed to be moving at 1 m/s and 2 seconds after that it is observed to be moving at 2 m/s. What can we conclude from these observations?
(A) The air track must have been level
(B) The end of the air track from which the car was released must have been elevated
(C) The end of the air track opposite to the end where the car was released must have been elevated.
(D) Without more information, no conclusions could be drawn from these observations
20. A ball of mass 4 kg attached to a string is swung in a circle of 2 meters radius at a speed of 3 m/s? If the string can sustain a maximum tension force of 20 N, will it break?
(A) Yes (B) No

21. A force, $F = 100 \text{ N}$ is applied to a wrench to tighten a bolt as shown. What is the torque applied to the bolt?



- (A) 5000 N m
 (B) 2 N m
 (C) 500 N m
 (D) 50 N m

22. Which of the following statements is FALSE concerning projectile motion?
 (A) The horizontal component of velocity is constant
 (B) The vertical component of velocity is not constant
 (C) The acceleration of the object is downward and constant
 (D) The vertical velocity is zero at the top of the path
 (E) It experiences an upward force on the way up and a downward force on the way down.
23. A force of 12 N acts on an object while moving it a distance of 3 m. How much work was done on the object by this force?
 (A) 4 J (B) 36 J (C) 0 J (D) 0.25 J
24. Whose astronomical observations of the planet Mars led to the discovery of the laws of planetary motion?
 (A) Newton (B) Galileo (C) Brahe (D) Kepler (E) Leonardo Da Vinci
25. How much work is required to lift a 2 kg object 1 meter and how much kinetic energy will it have when it falls back to the ground?

	Work	KE
(A)	2 J	2 J
(B)	20 J	20 J
(C)	20 J	0 J
(D)	20 J	10 J
(E)	20 N	40 J

ANSWERS

- 1) D
- 2) A
- 3) A
- 4) A
- 5) D
- 6) B
- 7) D
- 8) C
- 9) A
- 10) C
- 11) A
- 12) B
- 13) B
- 14) B
- 15) A
- 16) B
- 17) D
- 18) A
- 19) B
- 20) B
- 21) D
- 22) E
- 23) B
- 24) C
- 24) B