

SAT Physics Practice Paper 7

SET 1

1. An object that's moving with constant speed travels once around a circular path. True statements about this motion include which of the following?

- I. The displacement is zero.
 - II. The average speed is zero.
 - III. The acceleration is zero.
- A. I only
B. I and II only
C. I and III only
D. III only
E. II and III only






2. At time $t = t_1$, an object's velocity is given by the vector \mathbf{v}_1 shown below.



A short time later, at $t = t_2$, the object's velocity is the vector \mathbf{v}_2 .



If v_1 and v_2 have the same magnitude, which one of the following vectors best illustrates the object's average acceleration between $t = t_1$ and $t = t_2$?

- A. 
- B. 
- C. 
- D. 
- E. 

3. Which of the following must always be true?

- I. If an object's acceleration is constant, then it must move in a straight line.
- II. If an object's acceleration is zero, then its speed must remain constant.
- III. If an object's speed remains constant, then its acceleration must be zero.

- A. I and II only
- B. I and III only
- C. II only
- D. III only
- E. II and III only

4. A baseball is thrown straight upward. What is the ball's acceleration at its highest point?

- A. 0
- B. $\frac{1}{2}g$, downward
- C. g , downward

D. $\frac{1}{2}g$, upward

E. g , upward

5. How long would it take a car, starting from rest and accelerating uniformly in a straight line at 5 m/s^2 , to cover a distance of 200 m ?

- A. 9.0 s
- B. 10.5 s
- C. 12.0 s
- D. 15.5 s
- E. 20.0 s

6. A rock is dropped off a cliff and strikes the ground with an impact velocity of 30 m/s. How high was the cliff?

- A. 15 m
- B. 20 m
- C. 30 m

D. 45 m

E. 60 m

7. A soccer ball, at rest on the ground, is kicked with an initial velocity of 10 m/s at a launch angle of 30° . Calculate its total flight time, assuming that air resistance is negligible.

A. 0.5 s

B. 1 s

C. 1.7 s

D. 2 s

E. 4 s

8. A stone is thrown horizontally with an initial speed of 30 m/s from a bridge. Find the stone's total speed when it enters the water 4 seconds later. (Ignore air resistance.)

A. 30 m/s

B. 40 m/s

C. 50 m/s

D. 60 m/s

E. 70 m/s

9. Which one of the following statements is true concerning the motion of an ideal projectile launched at an angle of 45° to the horizontal?

A. The acceleration vector points opposite to the velocity vector on the way up and in the same direction as the velocity vector on the way down.

B. The speed at the top of the trajectory is zero.

C. The object's total speed remains constant during the entire flight.

D. The horizontal speed decreases on the way up and increases on the way down.

E. The vertical speed decreases on the way up and speed changes. D is false because the horizontal component is constant throughout the motion.

SET 2

1. A person standing on a horizontal floor feels two forces: the downward pull of gravity and the upward supporting force from the floor. These two forces

A. have equal magnitudes and form an action/reaction pair

B. have equal magnitudes but do not form an action/reaction pair

C. have unequal magnitudes and form an action/reaction pair

- D. have unequal magnitudes and do not form an action/reaction pair
- E. None of the above

2. A person who weighs 800 N steps onto a scale that is on the floor of an elevator car. If the elevator accelerates upward at a rate of 5 m/s^2 , what will the scale read?

- A. 400 N
- B. 800 N
- C. 1000 N
- D. 1200 N
- E. 1600 N

3. A frictionless inclined plane of length 20 m has a maximum vertical height of 5 m. If an object of mass 2 kg is placed on the plane, which of the following best approximates the net force it feels?

- A. 5 N
- B. 10 N
- C. 15 N
- D. 20 N
- E. 30 N

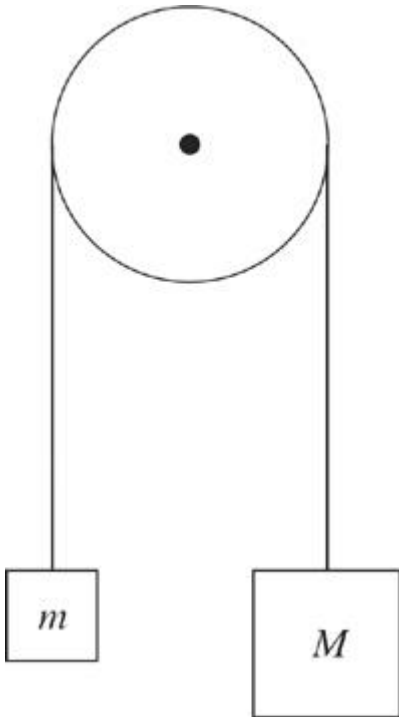
4. A 20 N block is being pushed across a horizontal table by an 18 N force. If the coefficient of kinetic friction between the block and the table is 0.4, find the acceleration of the block.

- A. 0.5 m/s^2
- B. 1 m/s^2
- C. 5 m/s^2
- D. 7.5 m/s^2
- E. 9 m/s^2

5. The coefficient of static friction between a box and a ramp is 0.5. The ramp's incline angle is 30° . If the box is placed at rest on the ramp, the box will

- A. accelerate down the ramp
- B. accelerate briefly down the ramp but then slow down and stop
- C. move with constant velocity down the ramp
- D. not move

E. Cannot be determined from the information given



6.

Assuming a frictionless, massless pulley, determine the acceleration of the blocks once they are released from rest.

A. $\frac{m}{M+m}g$

B. $\frac{M}{M+m}g$

C. $\frac{M}{m}g$

D. $\frac{M+m}{M-m}g$

E. $\frac{M-m}{M+m}g$

7. If all of the forces acting on an object balance so that the net force is zero, then

A. the object must be at rest

B. the object's speed will decrease

- C. the object will follow a parabolic trajectory
- D. the object's direction of motion can change, but its speed cannot
- E. None of the above

8. A block of mass m is at rest on a frictionless, horizontal table placed in a laboratory on the surface of the earth. An identical block is at rest on a frictionless, horizontal table placed on the surface of the moon. Let \mathbf{F} be the net force necessary to give the earth-bound block an acceleration of \mathbf{a} across the table. Given that g_{moon} is one sixth of g_{earth} , the force necessary to give the moon-bound block the same acceleration \mathbf{a} across the table is

A. $\frac{\mathbf{F}}{12}$

B. $\frac{\mathbf{F}}{6}$

C. $\frac{\mathbf{F}}{3}$

D. \mathbf{F}

E. $6\mathbf{F}$

9. A crate of mass 100 kg is at rest on a horizontal floor. The coefficient of static friction between the crate and the floor is 0.4, and the coefficient of kinetic friction is 0.3. A force F of magnitude 344 N is then applied to the crate, parallel to the floor. Which of the following is true?

A. The crate will accelerate across the floor at 0.5 m/s^2 .

B. The static friction force, which is the reaction force to \mathbf{F} as guaranteed by Newton's third law, will also have a magnitude of 344 N.

C. The crate will slide across the floor at a constant speed of 0.5 m/s.

D. The crate will not move.

E. None of the above

10. Two crates are stacked on top of each other on a horizontal floor; crate #1 is on the bottom, and crate #2 is on the top. Both crates have the same mass. Compared with the strength of the force \mathbf{F}_1 necessary to push only crate #1 at a constant speed across the floor, the strength of the force \mathbf{F}_2 necessary to push the stack at the same constant speed across the floor is greater than F_1 because

A. the force of the floor on crate #1 is greater

B. the coefficient of kinetic friction between crate #1 and the floor is greater

C. the force of kinetic friction, but not the normal force, on crate #1 is greater

D. the coefficient of static friction between crate #1 and the floor is greater

E. the weight of crate #1 is greater

11. If the distance between two point particles is doubled, then the gravitational force between them

A. decreases by a factor of 4

B. decreases by a factor of 2

C. increases by a factor of 2

D. increases by a factor of 4

E. Cannot be determined without knowing the masses

12. At the surface of the earth, an object of mass m has weight w . If this object is transported to an altitude that's twice the radius of the earth, then, at the new location,

A. its mass is $\frac{m}{2}$ and its weight is $\frac{w}{2}$

B. its mass is m and its weight is $\frac{1}{4} \frac{w}{2}$

C. its mass is $\frac{m}{2}$ and its weight is $\frac{w}{4}$

D. its mass is m and its weight is $\frac{w}{4}$

E. its mass is m and its weight is $\frac{w}{9}$

13. A moon of mass m orbits a planet of mass $100m$. Let the strength of the gravitational force exerted by the planet on the moon be denoted by F_1 , and let the strength of the gravitational force exerted by the moon on the planet be F_2 . Which of the following is true?

A. $F_1 = 100F_2$

B. $F_1 = 10F_2$

C. $F_1 = F_2$

D. $F_2 = 10F_1$

E. $F_2 = 100F_1$

14. The planet Pluto has $1/500$ the mass and $1/15$ the radius of Earth. What is the value of g on the surface of Pluto?

- A. 0.3 m/s_2
- B. 1.6 m/s_2
- C. 2.4 m/s_2
- D. 4.5 m/s_2
- E. 7.1 m/s_2

SET 3

1. A force \mathbf{F} of strength 20 N acts on an object of mass 3 kg as it moves a distance of 4 m. If \mathbf{F} is perpendicular to the 4 m displacement, the work it does is equal to

- A. 0 J
- B. 60 J
- C. 80 J
- D. 600 J
- E. 2,400 J

2. Under the influence of a force, an object of mass 4 kg accelerates from 3 m/s to 6 m/s in 8 s. How much work was done on the object during this time?

- A. 27 J
- B. 54 J
- C. 72 J
- D. 96 J
- E. Cannot be determined from the information given

3. A box of mass m slides down a frictionless inclined plane of length L and vertical height h . What is the change in its gravitational potential energy?

- A. $-mgL$
- B. $-mgh$
- C. $-mgL/h$
- D. $-mgh/L$
- E. $-mghL$

4. An object of mass m is traveling at constant speed v in a circular path of radius r . How much work is done by the centripetal force during one half of a revolution?

- A. πmv^2
- B. $2\pi mv^2$
- C. 0
- D. $\pi mv^2 r$
- E. $2\pi mv^2 r$

5. While a person lifts a book of mass 2 kg from the floor to a tabletop, 1.5 m above the floor, how much work does the gravitational force do on the book?

- A. -30 J
- B. -15 J
- C. 0 J
- D. 15 J
- E. 30 J

6. A block of mass 3 kg slides down a frictionless inclined plane of length 6 m and height 4 m. If the block is released from rest at the top of the incline, what is its speed at the bottom?

- A. 5 m/s
- B. 6 m/s
- C. 8 m/s
- D. 9 m/s
- E. 10 m/s

7. A block of mass 3 kg slides down an inclined plane of length 6 m and height 4 m. If the force of friction on the block is a constant 16 N as it slides from rest at the top of the incline, what is its speed at the bottom?

- A. 2 m/s
- B. 3 m/s
- C. 4 m/s
- D. 5 m/s
- E. 6 m/s

8. As a rock of mass 4 kg drops from the edge of a 40-meter-high cliff, it experiences air resistance, whose average strength during the descent is 20 N. At what speed will the rock hit the ground?

- A. 8 m/s

- B. 10 m/s
- C. 12 m/s
- D. 16 m/s
- E. 20 m/s

9. An astronaut drops a rock from the top of a crater on the moon. When the rock is halfway down to the bottom of the crater, its speed is what fraction of its final impact speed?

A. $\frac{1}{4\sqrt{2}}$

B. $\frac{1}{4}$

C. $\frac{1}{2\sqrt{2}}$

D. $\frac{1}{2}$

E. $\frac{1}{\sqrt{2}}$

10. A force of 200 N is required to keep an object sliding at a constant speed of 2 m/s across a rough floor. How much power is being expended to maintain this motion?

A. 50 W

B. 100 W

C. 200 W

D. 400 W

E. Cannot be determined from the information given

11. The moon has mass M and radius R . A small object is dropped from a distance of $3R$ from the moon's center. The object's impact speed when it strikes the surface of the moon is equal to $\sqrt{kGM/R}$ for $k =$

A. $\frac{1}{3}$

B. $\frac{2}{3}$

C. $\frac{3}{4}$

D. $\frac{4}{3}$

E. $\frac{3}{2}$