PHYCS101

Second Semester, 2025-2026

Final Exam Revision

1. The position of a particle moving along the x axis is given by x(t) = t^4 where x is in m and t is in s. What is the instantaneous acceleration in m/s2 of the particle at t=3 s?

(a) 108

(b) 192

(c) 300

(d) 432

(e) 588

2. The position of a particle moving along the x axis is shown in the figure. At what time in s is the particle momentarily at rest?

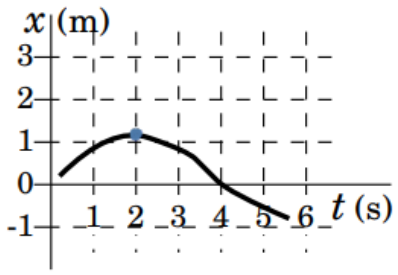
(a) 1

(b) 2

(c) 3

(d) 4

(e) 5



3. A car accelerates at a constant rate from an initial velocity of v_o=5 m/s. If it travels a distance of 200 m in 10 s, what is the final speed in m/s of the car?

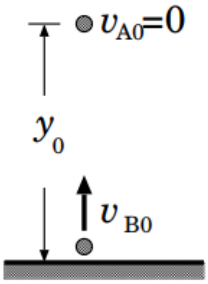
(a) 15

(b) 20

(c) 25

(d) 30

4. Ball A is dropped f va_o=0 from a height ff y_o=80 m and at the same time another ball is thrown vertically upward from ground level with a speed f vb_o=32 m/s. After how many seconds will the two balls meet?



(a) 1.0

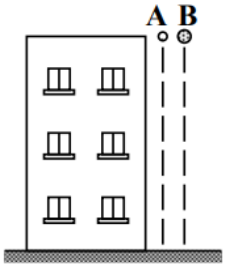
(b) 1.6

(c) 2.0

(d) 2.5

(e) 3.2

5. Two balls, ball A with mass f m_a=0.1 kg and ball B with mass f m_b=1 kg are dropped (f va_o=0 and vb_o=0) at the same moment from the same height from the top of a building. Assuming there is no air resistance, which of the two balls reaches the ground first?



(a) A

(b) B

(c) Both at the same time

(d) Depends on the height of the building

(e) Depends on the shape of the ball

6. A particle moving in the x – y plane is accelerating at a rate $\vec{a} = 2i - j\ m/s^2$ from an initial velocity of $\vec{v} = 4i + 2j$. What is its velocity in m/s after t=4 s?

(a) $10i - j$

(b) $12i - 2j$

(c) $14i - 3j$

(d) $16i - 4j$

(e) $18i - 5j$

7. A boy on top of a building throws a ball with a speed v_o=10 m/s at an angle θ_o=37◦ , as shown. If the ball strikes the ground at a distance x=24 m from the base of the building, how high (h) in m is the building?

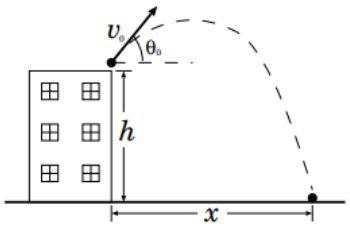
(a) 3.45

(b) 8.00

(c) 13.95

(d) 21.31

(e) 27.00



8. A ball is thrown with a speed v_o=10 m/s at an angle of θ_o==53◦ above the horizontal. What is the speed in m/s of the ball at the maximum height?

(a) 0

(b) 3

(c) 6

(d) 9

(e) 12

9. A force F=21 N accelerates a block at a rate a=7 m/s^2 . What is the mass in kg of the block?

(a) 3

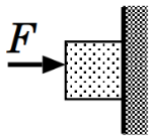
(b) 4

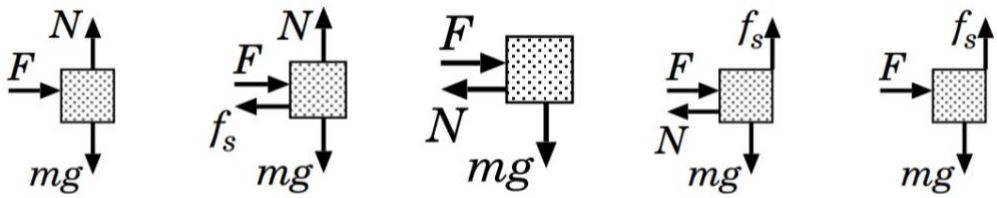
(c) 5

(d) 6

(e) 7

10. A block of mass m is held stationary by a horizontal force F pressing it against a rough vertical wall as in the figure. Which of the following free body diagrams represents this system?





11. Block with mass m1=15 kg is placed on a smooth incline making an angle θ=53◦ with the horizontal and connected by a massless string going over a massless pulley to a hanging block of mass m2. If the system remains at rest, what is the value of m2 in kg?

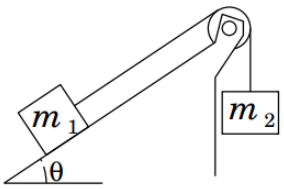
(a) 8

(b) 12

(c) 16

(d) 20

(e) 24



12. A block of mass m=10 kg rests on a rough horizontal surface with the coefficient of kinetic friction between the block and the surface μk=0.5. A force F making an angle θ=37◦ with the horizontal accelerates the block at a rate a=4.9 m/s2 , to the right. What is the magnitude of the force F in N?

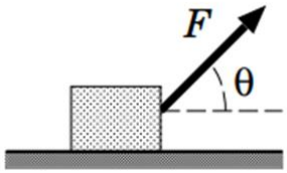
(a) 60

(b) 70

(c) 80

(d) 90

(e) 100



13. A block with mass m=6 kg is resting on a rough horizontal surface with the coefficient of static friction between the block and the surface μs=0.5. A horizontal force F=10 N is applied on the block. What is the magnitude of the static frictional force (fs) in N?

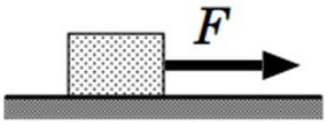
(a) 10

(b) 15

(c) 20

(d) 25

(e) 30



14. A mass m=2 kg is attached to the end of a r=1 m string and swung in a vertical circle. If at the lowest point the speed of the mass is v=6 m/s, what is the tension in N in the string?

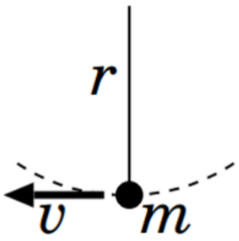
(a) 20

(b) 38

(c) 52

(d) 70

(e) 92



15. A variable force is given by F(x) = 12x 2 where F is in N and x is in m. What is the work done in J by the force from x=1 m to x=4 m?

(a) 28

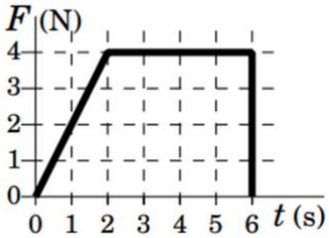
(b) 104

(c) 252

(d) 496

(e) 860

16. A block of mass m=4 kg is moving with a speed v_o=4 m/s in the positive x direction. A force F as shown in the figure is applied in the same direction. What is the final speed in m/s of the block?



(a) 7.3

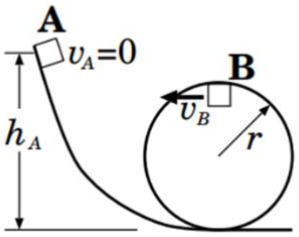
(b) 8.1

(c) 9.3

(d) 10.7

(e) 12.2

17. A block of mass m is placed at point A at a height hA up the smooth track as shown. The block is released from rest (v_a=0) and slides down the smooth track and goes through loop-the-loop of radius r=2 m. If the block has the minimum speed at point B to make it through the loop, what is the value of hA in m?



(a) 5

(b) 10

(c) 15

(d) 20

(e) 25

18. A 2kg block is held compressing a spring with force constant k=4000 N/m a distance x=0.2 m. The block is released from rest (point A) and moves up the rough track shown to a maximum height h_b=1.5 m (point B). How much energy in J is lost due to friction?

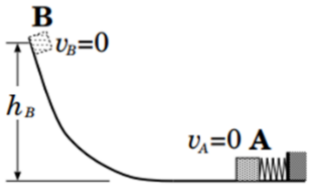
(a) -20

(b) -30

(c) -40

(d) -50

(e) -60



19. A force varies with time as F(t) = 3t 2 − 2t where F is in N and t is in s. What is the impulse in N·s delivered by the force from t=2 s to t=5 s?

(a) 14

(b) 44

(c) 96

(d) 176

(e) 290

20. A block of mass m=4 kg is moving with a speed v_i=6 m/s in the positive x direction. A force F as shown in the figure is applied in the same direction. What is the final speed in m/s of the block?

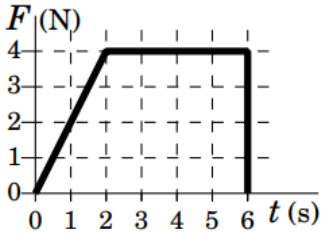
(a) 7

(b) 8

(c) 9

(d) 10

(e) 11



21. A 2 kg block initially traveling in the positive x direction with a speed of v_i=3 m/s. A force is applied increasing the speed to v_f=8 m/s in the same direction. What is the impulse in N·s delivered by the force?

(a) 4

(b) 6

(c) 8

(d) 10

(e) 12

22. A ball of mass m=0.2 kg initially moving with a speed vi=6 m/s strikes a wall and bounces back with a speed of v_f=4 m/s. The ball is in contact with the wall for 0.2 s, what is the magnitude of the average force in N applied by the wall on the ball?

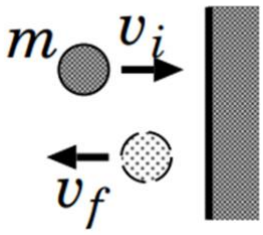
(a) 10

(b) 15

(c) 20

(d) 25

(e) 30



23. A block with mass m1=6 kg moving to the right with a speed v_{1i}=6 m/s on a smooth horizontal track collides with a second block of mass m2=2 kg moving to the right with a speed v_{2i}=2 m/s. After the collision block m1 moves to the right with a speed v_{1f}=4 m/s. What is the speed of the second block v_{2f} in m/s after the collision?

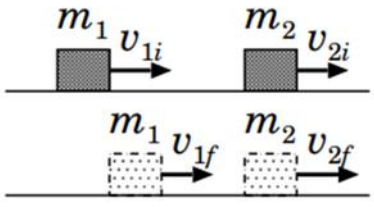
(a) 7

(b) 8

(c) 9

(d) 10

(e) 11



24. A block of mass m1=2 kg moving with a speed v_1=15 m/s collides and sticks to a second block of mass m2=1 kg initially at rest (v_2=0). After the collision the two blocks move together with a common speed v_f . How much energy in J is lost due to the collision?

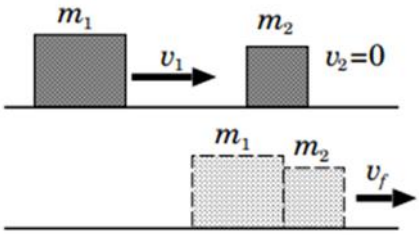
(a) -3

(b) -12

(c) -27

(d) -48

(e) -75



25. A block with mass m1=7 kg moving to the right with a speed v_{1i}=5 m/s collides head on with a second block of mass m2=3 kg moving to the left with a speed v_{2i}=5 m/s. After the collision, m1 is seen moving to the left with a speed v_{1f}=1 m/s and m2 to the right with a speed v_{2f}=9 m/s. Which of the following statements describes the collision?

(a) The collision is inelastic

(b) The collision is perfectly inelastic

(c) The collision is elastic

(d) The collision is not possible

(e) None of the above.