Dawson College

Physics 203-001-50
Remedial Activities for Secondary V Physics
Sample Final Examination

This exam is divided into two parts:

Part I: Problems (*10 marks each*) Solve all seven problems. Show all of your work, clearly and in order, to receive full marks. If you use a formula not given on the formula sheet, a derivation must be shown.

Part II: Multiple Choice Questions (*2 marks each*) Answer all fifteen questions. Circle the best response from the choices given. If your final selection is unclear you will not be given the marks. No marks will be awarded for diagrams, calculations, or reasoning.

Additional instructions:

1. The time allotted for this examination is three hours.
2. Answer directly on the question sheet. If you need extra room, you may use the back of another page.
3. Use $g = 9.80\,\mathrm{m/s^2}$.
4. When finished, return this entire package and the formula sheet to your instructor.

Good luck! ☺

P1	P2	P3	P4	P5	P6	MC	Total /100

Part I: Problems (*10 marks each*)

Solve all seven problems. Show all of your work, clearly and in order, to receive full marks. If you use a formula not given on the formula sheet, a derivation must be shown.

1. A car slows down from an initial velocity of 90.0 km/h to a final velocity of 36.0 km/h at a constant rate while undergoing a displacement of 105 m.

   (a) What is the acceleration of the car?

   (b) If the car continues with the same acceleration, how much additional time will it take to come to a stop?

   (c) What is the total displacement of the car from the instant when it's travelling at 90km/h until it stops?

   (d) Sketch the position-time curve for the car on the empty graph on the next page. Indicate the time and position at which it stops

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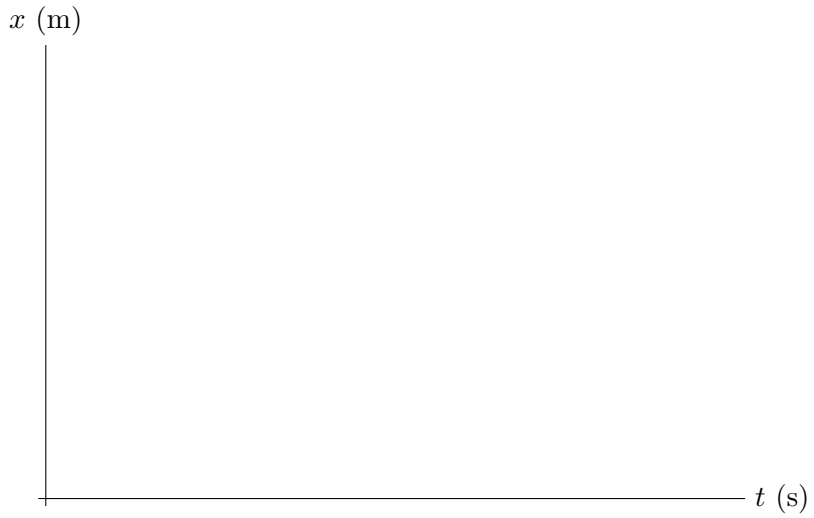
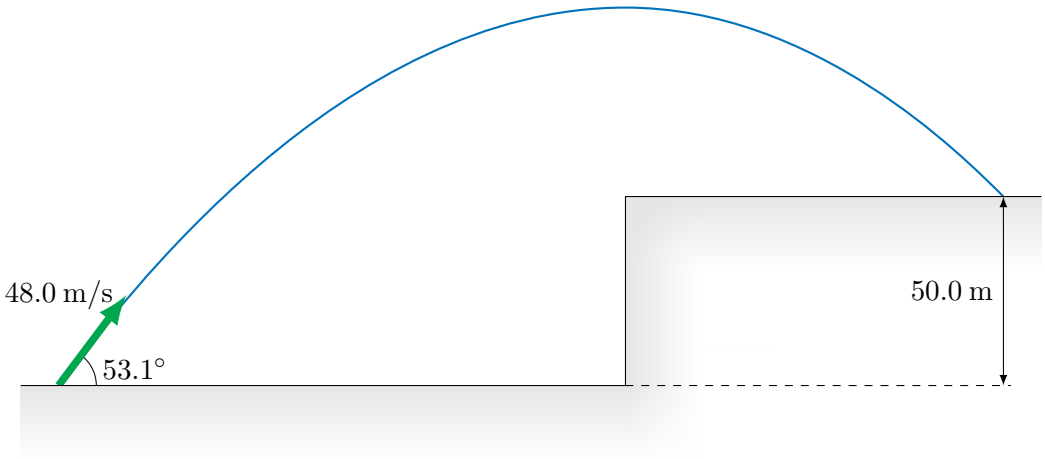

x (m)
t (s)

2. A projectile is launched at an angle of 53.1° above the horizontal at a speed of 48.0 m/s. The projectile lands on a 50.0 m high ledge.

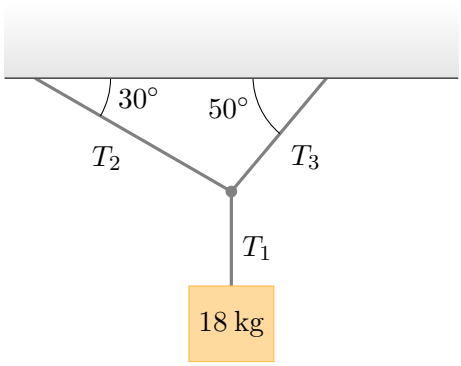


(a) What is the horizontal distance from the launch point to the landing point?

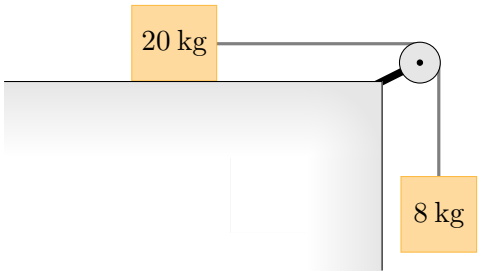
(b) What are the magnitude and direction of the projectile's velocity when it lands?

(c) What is the maximum height reached by the projectile?

3. An 18.0 kg block is suspended from three cables as shown below. What are the tensions T_1, T_2, and T_3?



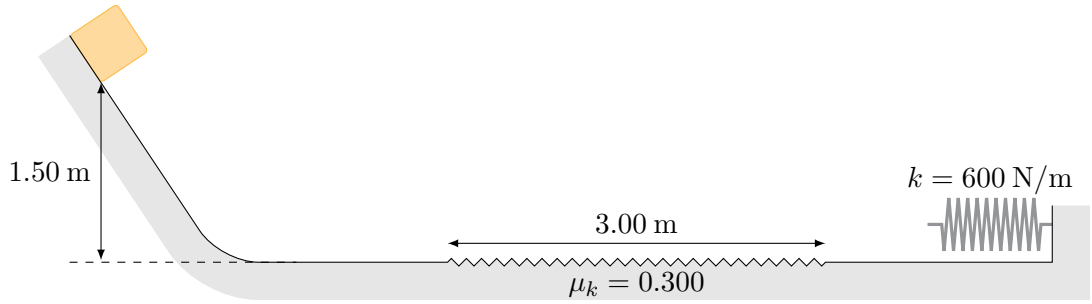
4. A 20.0 kg block on a horizontal surface is connected to a hanging 8.00 kg block by a string, as shown below.



(a) What is the minimum coefficient of static friction between the 20.0 kg block and the surface that would prevent the masses from moving?

(b) If the surface is frictionless, what is the acceleration of the 20.0 kg block and the tension in the string?

5. A 1.60 kg block starts from rest and slides along the surface shown below. The surface is frictionless except for the rough patch indicated. After crossing the rough patch the block hits a spring.

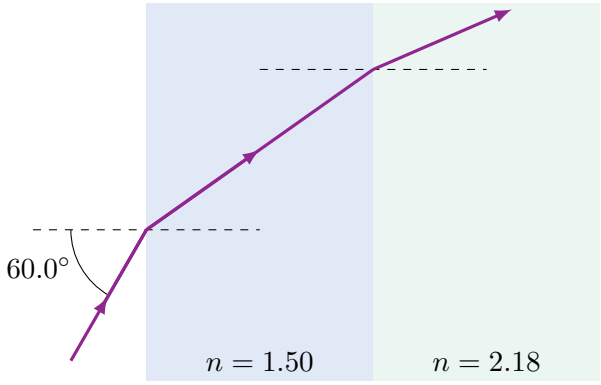


(a) What is the speed of the block just before it enters the rough patch?

(b) What is the speed of the block after crossing the rough patch?

(c) How far does the block compress the spring before it comes to rest?

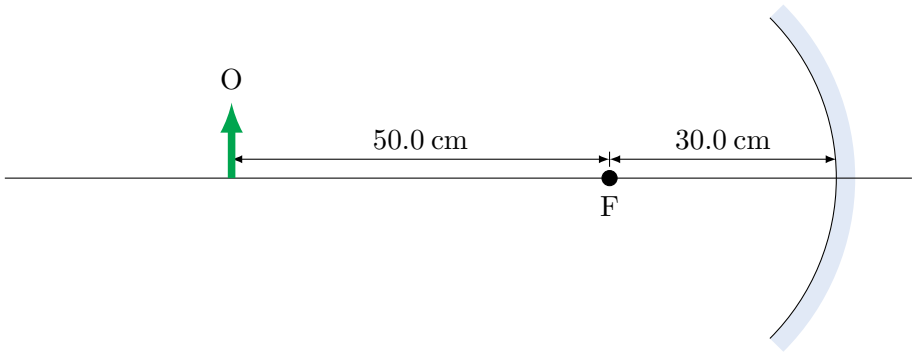
6. A stack of two transparent plates is surrounded by air. The indices of refraction of the plates are 1.50 and 2.18, respectively. Light in air is incident on the first plate at an angle of 60.0° relative to the normal.



(a) What is the angle of refraction when the light enters the second plate?

(b) When the light reaches the *top* of the second plate will it pass through the boundary? Justify your answer with a calculation.

7. A 10.0 cm tall object is placed 80.0 cm in front of a concave mirror with a focal length of 30.0 cm.



(a) What are the image distance and the image type (real or virtual)?

(b) What are the image height and the orientation of the image (upright or inverted)?

(c) Sketch a ray-diagram for this situation directly on the figure above. Indicate where the image is formed.

(d) How will the image change as the object is slowly moved towards the mirror eventually reaching its vertex? Briefly explain.

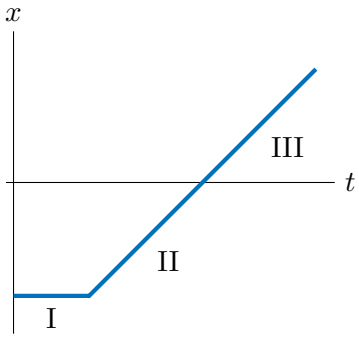
Part II: Multiple Choice Questions (*2 marks each*)

Answer all fifteen questions. Circle the best response from the choices given. If your final selection is unclear you will not be given the marks. No marks will be awarded for diagrams, calculations, or reasoning.

1. The density of water is $1\ \mathrm{g/cm^3}$. What is the density of water in $\mathrm{kg/m^3}$?

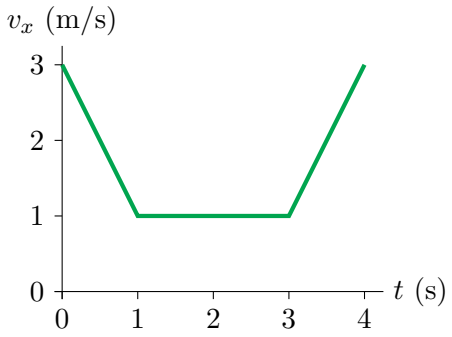
   (a) $1000\ \mathrm{kg/m^3}$
   (b) $100\ \mathrm{kg/m^3}$
   (c) $1\ \mathrm{kg/m^3}$
   (d) $0.01\ \mathrm{kg/m^3}$
   (e) $0.001\ \mathrm{kg/m^3}$

2. The position-time graph for an object is shown below. During which phase(s) of the motion is the velocity of the object positive?



   (a) Phase I
   (b) Phase II
   (c) Phase III
   (d) Phase I and phase II
   (e) Phase II and phase III

3. The velocity-time graph for an object is shown below. Which of the following statements is correct?



(a) The object has a negative displacement between $t = 0\,\text{s}$ and $t = 4\,\text{s}$

(b) The object has a positive displacement between $t = 0\,\text{s}$ and $t = 4\,\text{s}$

(c) The object has zero displacement between $t = 0\,\text{s}$ and $t = 4\,\text{s}$

(d) We need to know the mass of the object to determine its displacement

(e) Displacement cannot be determined from a velocity-time graph

4. The motion diagram of a particle is shown below. What is the sign of the acceleration?

(a) Acceleration is positive

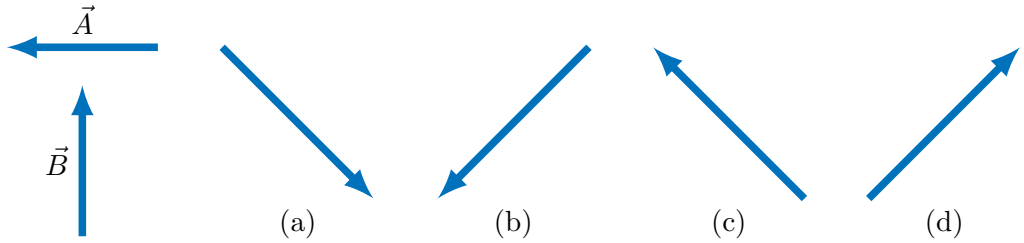
(b) Acceleration is negative

(c) Acceleration is zero

(d) Acceleration is positive then negative

(e) Acceleration is negative then positive

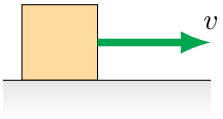
5. Two vectors $\vec{A}$ and $\vec{B}$ are shown below. Which of the choices is the resultant of the operation $\vec{B} - \vec{A}$?

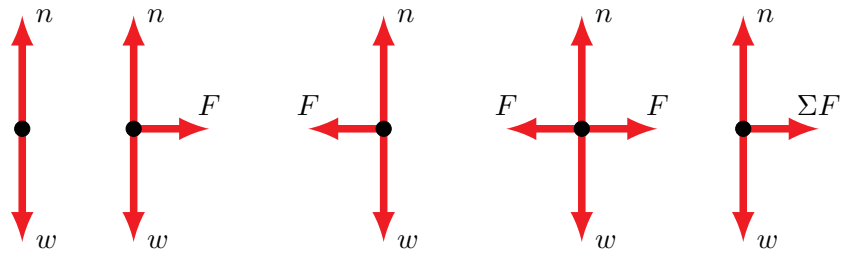


6. A ball is thrown straight up into the air. It rises to its maximum height, then falls back to its starting point. Assuming no air resistance, which of the following is true?

   (a) It takes less time to go up than to come back down
   (b) It takes more time to go up than to come back down
   (c) It takes equal time to go up and to come back down
   (d) It depends on the mass of the ball
   (e) It depends on how fast the ball is initially thrown

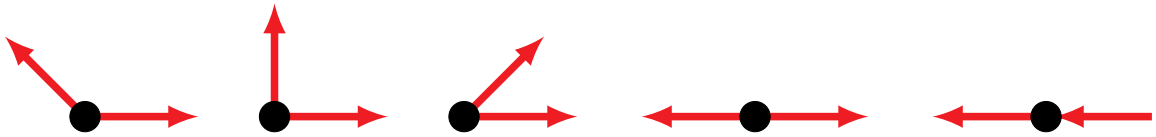
7. A block slides across a frictionless, horizontal surface with constant speed. Which of the choices is the correct free-body diagram for the block?





(a) (b) (c) (d) (e)

8. Five identical hockey pucks are shown below. Which puck has the acceleration with the greatest magnitude? [All the forces have the same magnitude]

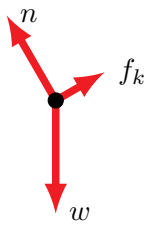


(a) (b) (c) (d) (e)

9. You throw a rock against a window. The rock does not break the window, instead it bounces off. Which of the following statements is correct?

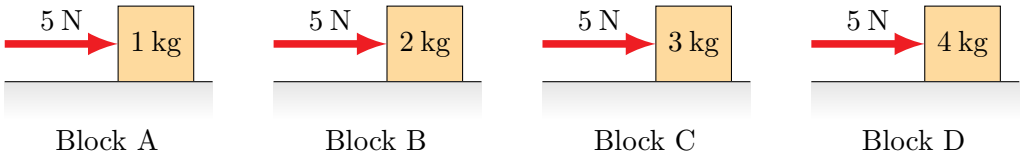
   (a) The force of the rock on the window is greater than the force of the window on the rock
   (b) The force of the rock on the window is less than the force of the window on the rock
   (c) The force of the rock on the window is equal to the force of the window on the rock
   (d) The rock exerts no force on the window
   (e) The window exerts no force on the rock

10. Which of the following situations does the free-body diagram shown below best represent?



(a) A block sliding up a slope
(b) A block sliding down a slope
(c) A block at rest on a slope
(d) A block sliding to the left across a horizontal surface
(e) A block sliding to the right across a horizontal surface

11. Each of the four blocks shown below is pushed 10 m across a horizontal, frictionless surface by a 5 N force. How does the work done on each block compare?

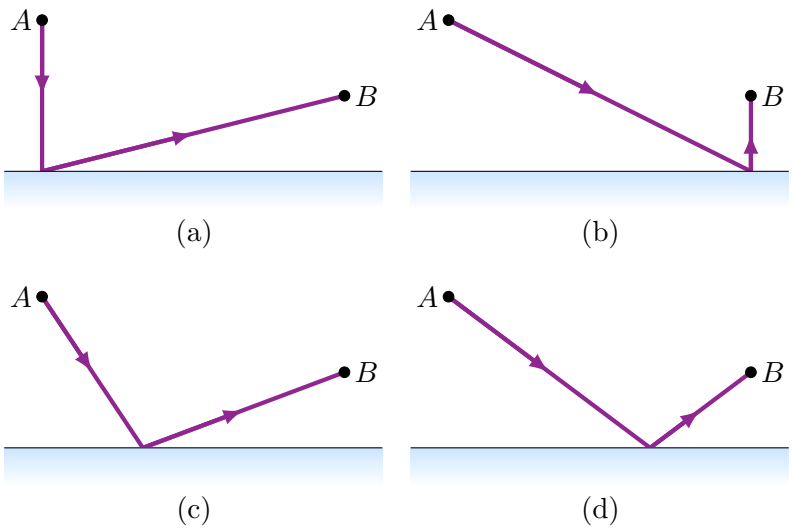


(a) $W_A = W_B = W_C = W_D$
(b) $W_A < W_B < W_C < W_D$
(c) $W_A > W_B > W_C > W_D$
(d) $W_A = W_B < W_C = W_D$
(e) $W_A = W_B > W_C = W_D$

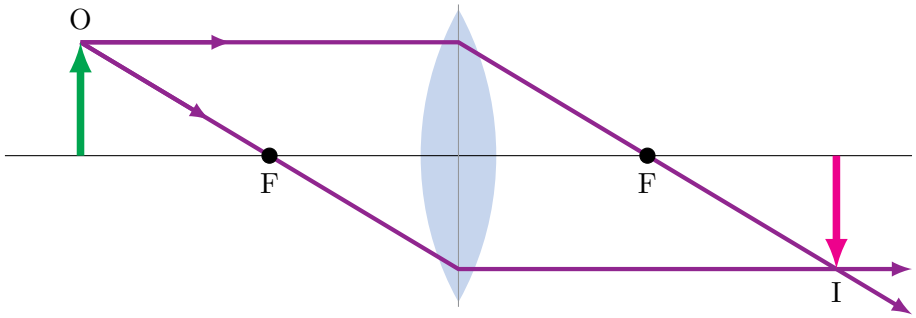
12. Guillaume and Henri want to go to the top of the Eiffel Tower. Guillaume takes the elevator straight up, while Henri decides to walk up the spiral stairway. Who has a greater change in gravitational potential energy upon reaching the top?

(a) Guillaume
(b) Henri
(c) Both have the same change in potential energy
(d) Impossible to determine without knowing the time it takes to reach the top
(e) Impossible to determine without knowing the mass of each person

13. A ray of light leaves point A, reflects off of a mirror, and arrives at point B. Which of the choices shows the correct path the ray takes from A to B?



14. A converging lens forms an an image I of an object O as shown in the ray-tracing diagram below. What are the characteristics of the image?



(a) Virtual, inverted, unmagnified
(b) Virtual, inverted, reduced
(c) Virtual, upright, magnified
(d) Real, inverted, unmagnified
(e) Real, upright, reduced

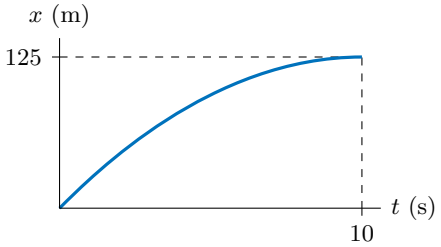
15. A physics student wants to create a virtual image. What type of lens should she use?

(a) A converging lens
(b) A diverging lens
(c) Both (a) and (b) would work
(d) Neither (a) nor (b) would work
(e) Only mirrors can create virtual images

Answers

Problems

1. (a) $a_x = -2.50\ \text{m/s}^2$ (b) $\Delta t = 4.00\ \text{s}$ (c) $x_f = 125\ \text{m}$
   (d)



2. (a) $x_f = 178\ \text{m}$ (b) $v_f = 36.4\ \text{m/s}$, $\theta_f = -37.6°$ (c) $y_{\max} = 75.2\ \text{m}$

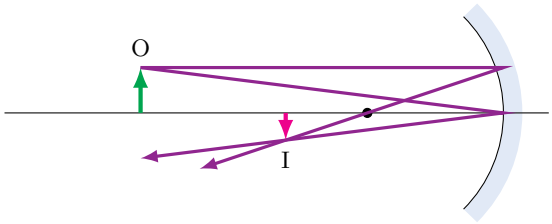
3. $T_1 = 176\ \text{N}$, $T_2 = 115\ \text{N}$, $T_3 = 155\ \text{N}$

4. (a) $\mu_s = 0.400$ (b) $a_x = 2.8\ \text{m/s}^2$, $T = 56.0\ \text{N}$

5. (a) $v_f = 5.42\ \text{m/s}$ (b) $v_f = 3.43\ \text{m/s}$ (c) $\Delta x = 0.177\ \text{m}$

6. (a) $\theta_2 = 23.4°$ (b) No, because $\theta_1 = 66.6° > \theta_c = 27.3°$

7. (a) $s' = 48.0\ \text{cm}$ (real) (b) $h' = -6.00\ \text{cm}$ (inverted, reduced)
   (c)



   (d) As the object moves towards the focal point the image remains real and inverted, but gets larger. When the object is at the focal point there is no image. When the object passes the focal point the image becomes virtual and gets smaller as the object approaches the vertex.

Multiple Choice

1. (a)	6. (c)	11. (a)
2. (e)	7. (a)	12. (e)
3. (b)	8. (e)	13. (d)
4. (b)	9. (c)	14. (d)
5. (d)	10. (b)	15. (c)