Name: _____

Teacher: _____

DO NOT OPEN THE EXAMINATION PAPER UNTIL YOU ARE TOLD BY THE SUPERVISOR TO BEGIN

Physics 2204

FINAL EXAMINATION

June 2011

Value: 80 Marks

General Instructions

This examination consists of two parts. Both parts are contained in this booklet and further general instructions are provided on appropriate pages.

Part I – Multiple Choice (40 Marks)

Select the letter of the correct response from those provided. EITHER shade the letter on your computer scorable card OR place the letter in the blank provided on your Multiple Choice Answer Sheet, whichever format is being used by your school for this exam. **Do ALL questions in this section**.

Part II – Constructed Response (40 Marks)

Answer ALL questions fully and concisely in the space provided.

Student Checklist

The items below are your responsibility. Please ensure that they are completed.

Write your name and teacher's name on the top of this page.

Write your name, teacher's name, course name and number on the Part I answer sheet.

Check the exam to see that there are no missing pages.

ALL MATERIALS MUST BE PASSED IN WITH THIS EXAM.
Use your time wisely. Good luck!

Part I

Total Value: 40 Marks

1. Which is a scalar quantity?

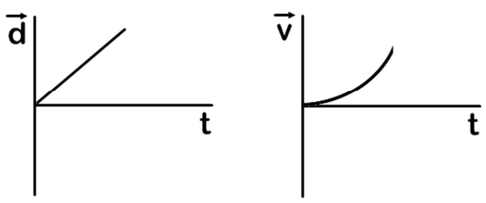
   (A) acceleration
   (B) distance
   (C) force
   (D) velocity

2. An object travels with uniform motion at 20 m/s for 10 s. What is the acceleration?

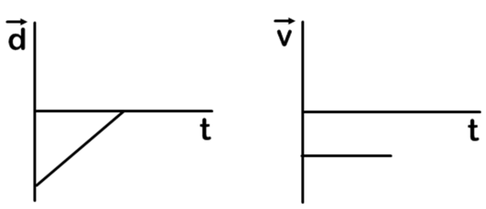
   (A) 0 m/s^2
   (B) 0.5 m/s^2
   (C) 2 m/s^2
   (D) 20 m/s^2

3. Which pair of graphs represents the same motion?

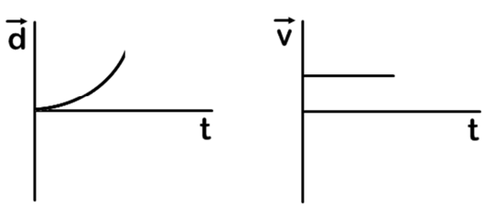
   (A)



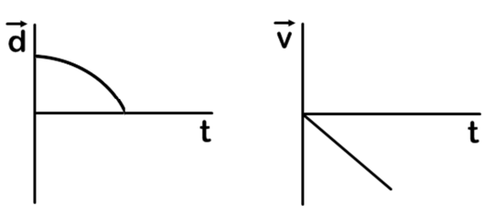
   (B)



   (C)

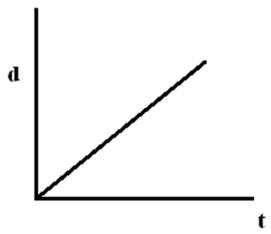


   (D)



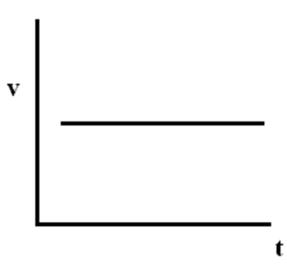
4. Which graph represents the motion of a cart rolling down a ramp?

(A)



(B)

(C)



(D)

5. A bus moves 18 m [E] relative to the ground. A ball on the bus rolls 7 m [W] relative to the bus. What is the displacement of the ball relative to the ground?

(A) 11 m [E]
(B) 11 m [W]
(C) 25 m [E]
(D) 25 m [W]

6. A plane travels at a velocity of 3.0×10^2 km/h [N] for 2.0 h, then changes direction and travels with a velocity of 2.0×10^2 km/h [W] for 1.0 h. What is the magnitude of the plane's displacement?

(A) 2.5×10^2 km
(B) 3.6×10^2 km
(C) 5.0×10^2 km
(D) 6.3×10^2 km

7. A skateboarder initially moving at 5.0 m/s [W] slows to a stop. Which is true regarding the skateboarder's motion?

	Displacement	Acceleration
(A)	East	East
(B)	East	West
(C)	West	East
(D)	West	West

8. An iPod rests on a 1.2 m high table. How much time does it take to fall to the floor?

(A) 0.24 s
(B) 0.49 s
(C) 1.9 s
(D) 3.7 s

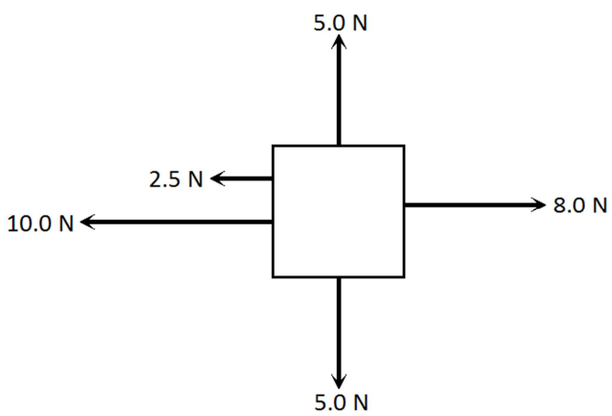
9. An airplane lands with an initial speed of 120 m/s. The acceleration of the airplane as it comes to a stop is $-11.6\ m/s^2$. How far does the airplane travel before stopping?

(A) 620 m
(B) 730 m
(C) 1200 m
(D) 1400 m

10. Which describes an object where the net force is zero?

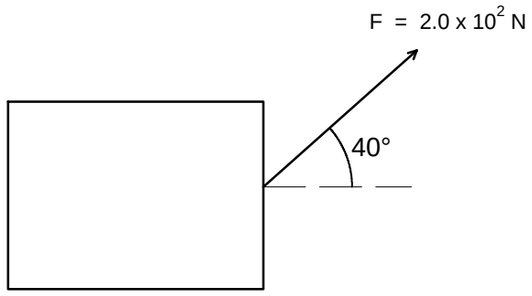
(A) an airplane coming to a stop
(B) a ball accelerating down an incline
(C) a baseball thrown vertically into the air
(D) a lab cart being pulled at a constant rate

11. What is the net force acting on the block?



(A) 4.5 N [E]
(B) 4.5 N [W]
(C) 6.7 N [E]
(D) 6.7 N [W]

12. What is the magnitude of the vertical component of the 2.0×10^2 N applied force shown?

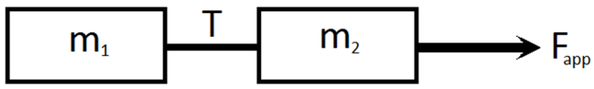


(A) 1.3×10^2 N
(B) 1.5×10^2 N
(C) 1.7×10^2 N
(D) 2.0×10^2 N

13. What is the weight of a 15.0 kg dog?

(A) 1.47 N
(B) 9.80 N
(C) 15.0 N
(D) 147 N

14. A force of 22 N is pulling two carts to the right on a frictionless surface. If both carts have the same mass, what is the tension, T, in the string connecting m_1 and m_2?

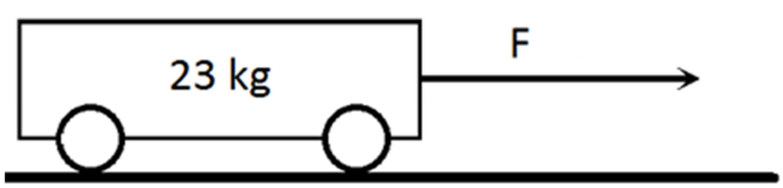


(A) 0 N
(B) 11 N
(C) 22 N
(D) 44 N

15. You stop your car suddenly and your Physics textbook slides off the back seat. Which of Newton's Laws best explains why this happens?

(A) Newton's 1st Law of Motion
(B) Newton's 2nd Law of Motion
(C) Newton's 3rd Law of Motion
(D) Newton's Law of Universal Gravitation

16. A 23 kg cart is being pulled by a horizontal force. The coefficient of kinetic friction between the cart and the surface is 0.14. What is the force of kinetic friction acting on the cart?



$\mu = 0.14$

(A) 3.2 N
(B) 32 N
(C) 160 N
(D) 230 N

17. What happens to the gravitational force of attraction between two objects if the mass of one of the objects doubles?

(A) decreases by a factor of 2
(B) decreases by a factor of 4
(C) increases by a factor of 2
(D) increases by a factor of 4

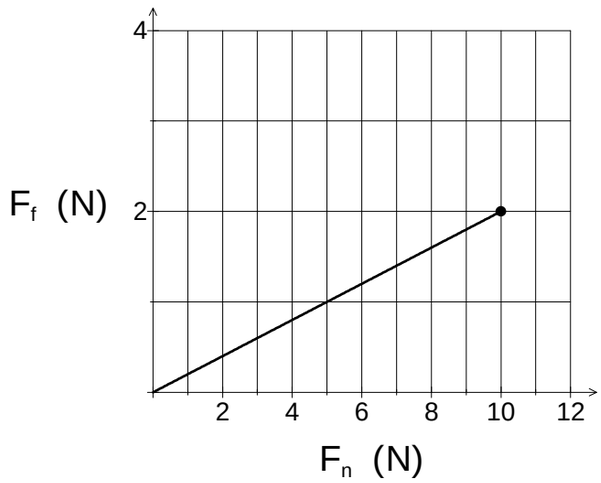
18. If the impulse on a 55 g golf ball is 2.2 N·s, what is the change in momentum of the golf ball?

(A) 0.040 kg·m/s
(B) 2.2 kg·m/s
(C) 25 kg·m/s
(D) 120 kg·m/s

19. What is the mass of a shopping cart moving at a velocity of 2.60 m/s [W] if its momentum is 35.1 kg·m/s [W]?

(A) 2.60 kg
(B) 10.4 kg
(C) 13.5 kg
(D) 91.3 kg

20. The graph below shows the frictional force versus normal force in an experiment. What is the coefficient of kinetic friction?



(A) 0
(B) 0.2
(C) 2
(D) 5

21. What type of potential energy results from the bending, stretching, or compressing of matter?

(A) chemical
(B) elastic
(C) gravitational
(D) nuclear

22. Which factor affects the amount of work done on an object which is being pulled across a horizontal, frictionless surface?

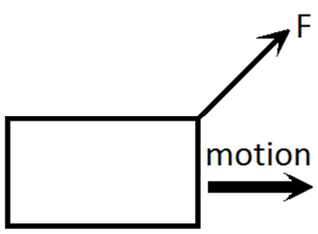
(A) displacement
(B) mass
(C) speed
(D) time

23. How will the energy of an object change as it falls?

	Kinetic Energy	Gravitational Potential Energy
(A)	Decreases	Decreases
(B)	Decreases	Increases
(C)	Increases	Decreases
(D)	Increases	Increases

24. In which situation is the most work being done by the force, F?

(A)



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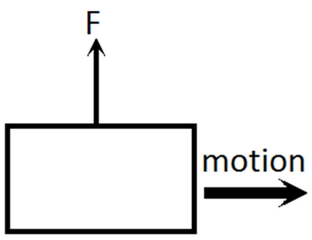

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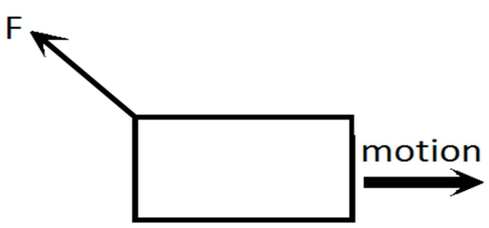

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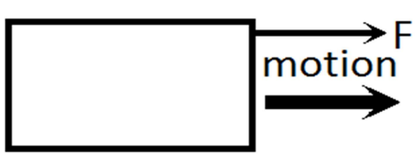


25. How much power is generated in lifting a 55 kg block 3.5 m in a time of 3.2 s?

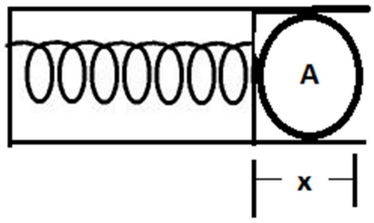
(A) 36 W
(B) 490 W
(C) 590 W
(D) 1900 W

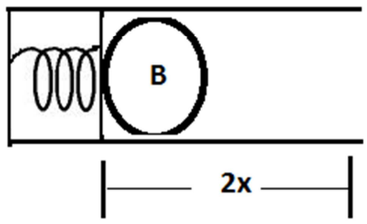
26. A force of 6.5 N is exerted upon an object causing it to move at 0.80 m/s for 9.0 s. How much work is done on the object?

(A) 0.58 J
(B) 1.1 J
(C) 47 J
(D) 73 J

27. Two balls with the same mass are placed on springs with the same spring constant. If spring B is compressed twice as much as spring A, how will the speed of ball B compare with the speed of ball A when they leave the springs?

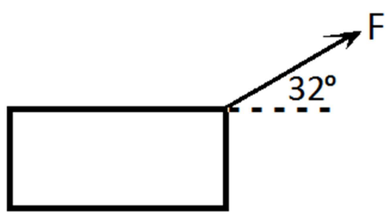
(A) $\frac{1}{4}$ times as large
(B) $\frac{1}{2}$ times as large
(C) 2 times as large
(D) 4 times as large





28. How much work is done by a 4.50×10^2 N force applied at an angle of 32°, while moving the block a distance of 2.0 m?

(A) 3.8×10^2 J
(B) 4.8×10^2 J
(C) 7.6×10^2 J
(D) 9.0×10^2 J



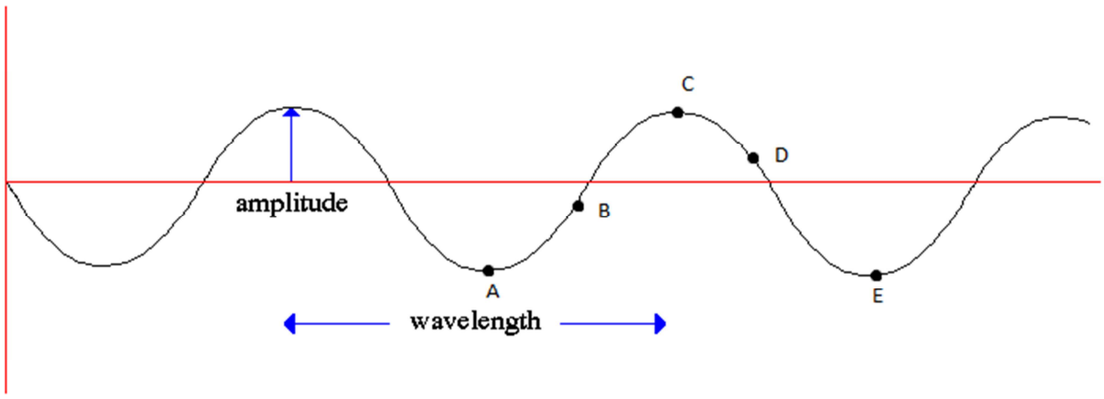
29. What is the speed of a 2.9 kg object that has 16 J of kinetic energy?

(A) 1.6 m/s
(B) 2.7 m/s
(C) 3.3 m/s
(D) 5.5 m/s

30. A transverse wave is moving from left to right. In which direction will a particle at the crest of the wave move next?

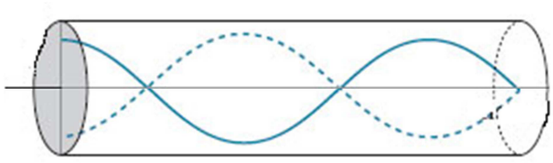
(A) down
(B) left
(C) right
(D) up

31. On the wave below, which pair of points is in phase?



(A) A and E
(B) B and D
(C) C and D
(D) C and E

32. Which **overtone** is shown in the closed air column below?



(A) 1st
(B) 2nd
(C) 3rd
(D) 4th

33. Given the index of refraction for three materials, $n_A = 1.00$, $n_G = 1.50$ and $n_W = 1.33$, which best compares the speed of light in each material?

(A) $v_A > v_W > v_G$
(B) $v_A < v_W < v_G$
(C) $v_G > v_W > v_A$
(D) $v_W > v_G > v_A$

34. Which property of light explains why shadows form?

(A) Doppler Effect
(B) Rectilinear Propagation
(C) Reflection
(D) Refraction

35. A person, standing in a canyon, shouts and hears an echo 1.63 s later. If the air temperature is 25.0°C, what is the distance to the canyon wall?

(A) 258 m
(B) 283 m
(C) 517 m
(D) 566 m

36. Two students are at a concert. Student A is standing 2 m from the stage and student B is standing 6 m from the stage. How does the sound intensity experienced by student A compare to that experienced by student B?

(A) 3 times greater
(B) 4 times greater
(C) 9 times greater
(D) 16 times greater

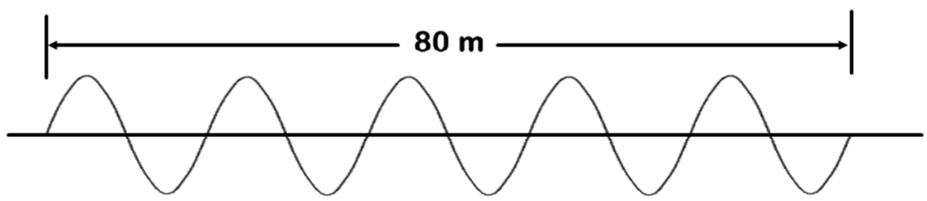
37. Eight waves strike a shoreline in 48 s. What is the period of the waves?

(A) 0.17 s
(B) 6.0 s
(C) 56 s
(D) 380 s

38. What is the critical angle for light travelling from ethyl alcohol (n = 1.36) into air?

(A) 0°
(B) 21°
(C) 47°
(D) 90°

39. What is the wavelength of the wave shown?



(A) 8.00 m
(B) 16.0 m
(C) 8.00×10^{1} m
(D) 4.00×10^{2} m

40. An object is traveling at Mach 2 on a day when the outside temperature is 15^{o} C. How fast is the object traveling?

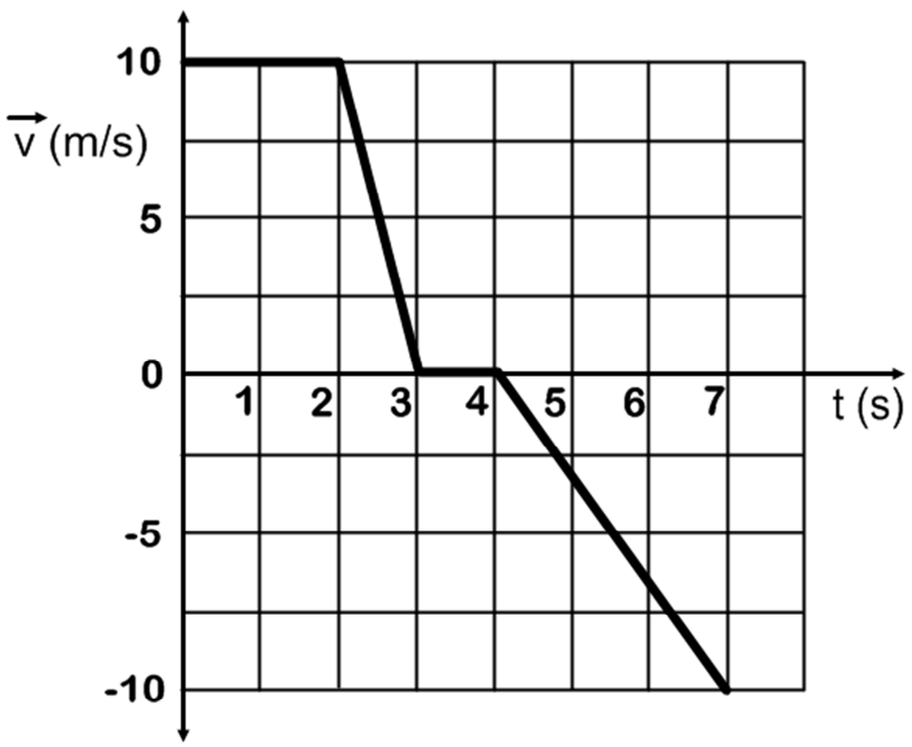
(A) 171 m/s
(B) 341 m/s
(C) 664 m/s
(D) 682 m/s

PART II
Total Value: 40 Marks

Answer **ALL** questions in the space provided. *Show all workings and report all final answers with correct significant digits and units.*

Value

41. (a)



1 (i) Determine the object's acceleration from 4 s to 6 s.

2 (ii) Determine the object's displacement from 0 s to 6 s.

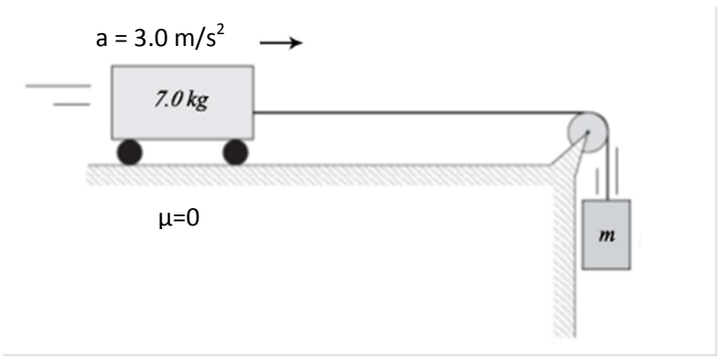
3 (b) A rocket is launched vertically from the ground at a constant velocity of 41 m/s. After travelling at this velocity for 1.6 s, the rocket runs out of fuel. What is the maximum height the rocket reaches above the ground?

3 (c) A plane can travel at 350 km/h in still air and a wind is blowing at 65 km/h [S]. In what direction should the pilot head in order to end up directly East of the starting point? Include a vector diagram in your answer.

4 42. (a) Two Physics students are fighting over a Wii controller. One pulls with a force of 4.0×10^2 N [W], while the other pulls with a force of 3.0×10^2 [E 50° N]. Calculate the net force exerted on the controller.

4 (b) A 65 kg athlete is running at a constant velocity of 3.50 m/s [E] when he jumps on a stationary 12 kg sled. If friction is ignored, with what velocity does the athlete and sled move?

3 (c) A 7.0 kg cart is being accelerated at 3.0 m/s^2 by a hanging mass in a frictionless system. Calculate the value of the hanging mass.



43. (a) An 80.0 kg stuntman falls from the top of a 70.0 m high building.

2 (i) What is the total mechanical energy of the stuntman when on top of the building?

2 (ii) What is the stuntman's speed at a height of 30.0 m above the ground?

3 (b) A 45 kg child bounces on a trampoline with a spring constant of 10800 N/m. If the trampoline is compressed 0.35 m and is 75% efficient, how high will the child bounce above the uncompressed trampoline?

2 (c) A javelin with a mass of 1.2 kg is thrown at a speed of 28 m/s. How much force does the athlete exert over a throwing distance of 1.5 m?

3 44. (a) A car is moving towards a stationary observer at 15.1 m/s when the driver blows the horn with a frequency of 870 Hz. If the speed of sound is 344 m/s what is the frequency of the sound perceived by the observer?

(b) When a tuning fork is held over an adjustable tube open at both ends, the distance between the 1st and 2nd resonant lengths is measured to be 0.12 m.

2 (i) Draw the standing wave pattern for the 1st and 2nd resonant length

2 (ii) What is the wavelength of the sound causing the resonance?

1 (iii) What is the frequency of the tuning fork if the speed of sound is 344 m/s?

3 (c) Using the concept of diffraction, explain why it is possible to hear someone who is standing just around the corner of a building, but it is not possible to see them.

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End of Part II