Sample Sample Sample

O'DONEL HIGH SCHOOL
PHYSICS 2204

FINAL EXAMINATION

Sample *Exam*

Value: 80 marks

Time: 2 hours

GENERAL INSTRUCTIONS

1. **This is a two part test. All parts are contained in this booklet. The examination consists of items arranged as follows:**

PART I	**40 multiple choice items**	**Do ALL items**	**50%**
PART II	**11 written response items**	**Do ALL items**	**50%**

2. **Part I is to be answered on the *Scantron Sheet* provided *using a HB pencil*. Shade the letter of the best correct response on the Scantron Sheet, and fully erase any other markings you may make.**

3. **Part II is to be answered in the space provided.**

4. **Ensure that you show all workings and draw diagrams where appropriate.**

Name: _____

Part I Multiple Choice [40 marks]

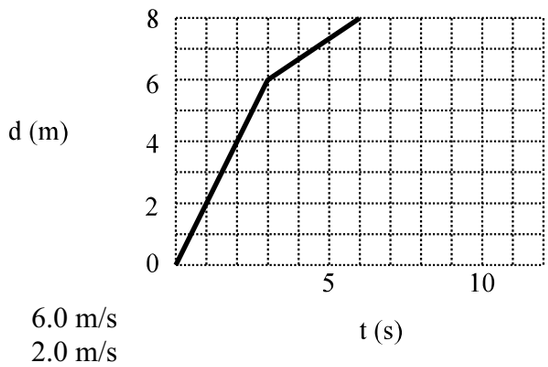
1. What is distinguishing about a vector quantity?

   a) it explains why objects are in motion
   b) it has only a magnitude
   c) it has a magnitude and direction
   d) it is at rest

2. An object travels a distance of 6.0×10^3 m with a uniform speed of 1.5×10^4 m/s. How long does it take?

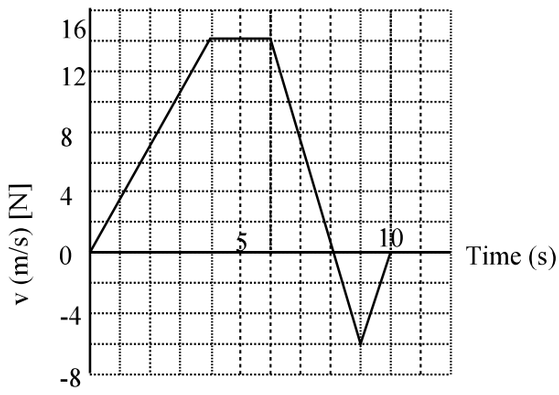
   a) 4.0×10^1 s
   b) 2.5 s
   c) 4.0×10^{-1} s
   d) 2.5×10^{-1} s

3. In the diagram , what is the average speed during the interval from t = 3.0 s to t = 6.0 s?



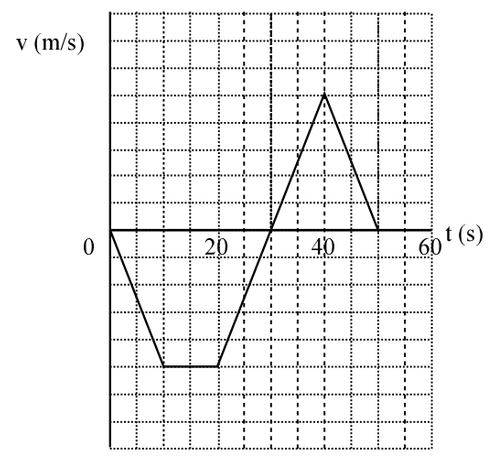
   a) 6.0 m/s
   b) 2.0 m/s
   c) 1.5 m/s
   d) 0.67 m/s

4. The graph shows the motion of a bicycle during a period of 10.0 s. What is the average acceleration from t = 6.0 s to t = 9.0 s ?



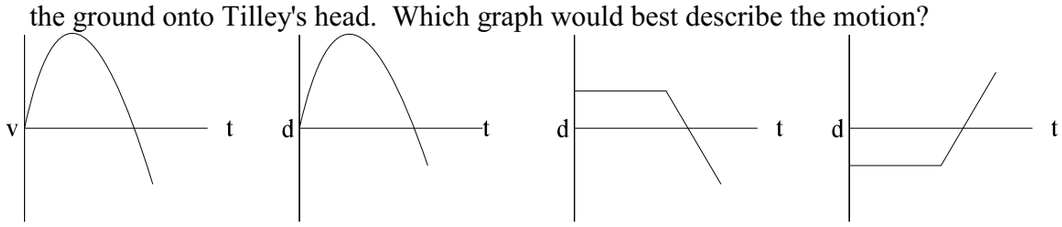
   a) -6.7 m/s^2
   b) -0.15 m/s^2
   c) 0.0 m/s^2
   d) 7.0 m/s^2

5. During which interval will the object be moving to the left and speeding up?



   a) 0 to 10 s
   b) 10 to 20 s
   c) 20 to 40 s
   d) 40 to 50 s

6. Mr. Furey is standing on a high tower tosses a stone upward and allows it to fall toward the ground onto Tilley's head. Which graph would best describe the motion?



A B C D

7. Ramsay's sports car increases its speed along a straight road from 20.0 km/hr to 50.0 km/hr in a time of 2.0 s What is the magnitude of the acceleration of the car?

a) 4.0 (km/hr)/s
b) 6.0 (km/hr)/s
c) 7.0 (km/hr)/s
d) 15 (km/hr)/s

8. Shawn falls from a tall building. After falling for 1.0 s, what is its approximate speed?

a) 3.0 m/s
b) 9.8 m/s
c) 13 m/s
d) 29 m/s

9. Meghan kicks a ball straight up into the air at a velocity of 15.0 m/s. What is the ball's velocity after 1.5 s?

a) - 15 m/s
b) - 8.2 m/s
c) 0.30 m/s
d) 29 m/s

10. Which quantity is most closely related to the inertia of an object?

a) density
b) mass
c) position
d) velocity

11. Which statement is always true?

a) if an object is at rest, no forces act on it
b) if an object is moving, an unbalanced force acts on it
c) if an object is moving, it has a tendency to come to rest
d) if an object is moving, it has a tendency to keep moving

12. What is the momentum of a 250.0 kg snowmobile moving at 20.0 m/s [N]?

a) 5.00 kg m/s [N]
b) 12.5 kg m/s [N]
c) 2.50×10^3 kg m/s [N]
d) 5.00×10^3 kg m/s [N]

13. A steel ball of mass 1.0 kg rolls down an inclined track where the friction is 2.0 N. The pull of gravity on the ball supplies a force of 5.0 N along the track. What is the acceleration of the ball along the track?

a) 3.0 m/s^2 [down]
b) 5.0 m/s^2 [down]
c) 7.0 m/s^2 [down]
d) 9.0 m/s^2 [down]

14. A lawnmower is pushed with a force of 100.0 N at an angle of 30˚ below the horizontal. What is the magnitude of the horizontal component of the force?

a) 50.00 N
b) 86.67 N
c) 100.0 N
d) 150.0 N

15. When one body exerts a force on a second body, the second body exerts a force on the first body. What can be said about the force on the first body?

a) equal in magnitude but opposite in direction
b) equal in magnitude and in the same direction
c) smaller in magnitude in the same direction
d) smaller in magnitude but opposite in direction

16. Two boys, one with a mass of 70 kg and the other with a mass of 60 kg are standing side by side in the middle of an ice rink. One of them pushes the other with a force of 420 N for 0.10 s. What speed will the 70 kg boy reach?

a) 0.6 m/s
b) 0.7 m/s
c) 6.0 m/s
d) 7.0 m/s

17. Find the net force of the following forces acting on a body.
F_1 = 25 N [W] F_2 = 10 N [S] F_3 = 15 N [N]

a) 25.5 N [W11.3˚N]
b) 25.5 N [N11.3˚W]
c) 24.5 N [W11.3˚N]
d) 24.5 N [N11.3˚W]

18. A 0.20 kg sponge is dropped from rest, pulled down by gravity. How fast will it be travelling in 6.0 s if there is a 0.50 N force of air resistance acting on it?
a) 9.8 m/s
b) 15 m/s
c) 44 m/s
d) 59 m/s

19. What is the unbalanced force acting on a 5.0 kg Pennell if it accelerates from rest to 150 m/s in 0.050 s?
a) 1.5×10^1 N
b) 1.5×10^3 N
c) 1.5×10^4 N
d) 1.5×10^5 N

20. If a momentum of 4.0×10^2 kg m/s is transferred to a ball in 0.10 s, what is the magnitude of the force on the ball?

a) 4.0 N
b) 4.0×10^1 N
c) 4.0×10^2 N
d) 4.0×10^3 N

21. Mr. Furey uses a 1200 W hair dryer for 15 minutes to dry his hair. How much energy does this expend?

a) 1.1×10^6 J
b) 1.8×10^4 J
c) 80 J
d) 7.2×10^7 J

22. How much work is done in raising a one kilogram mass through a distance of 1.0 m?

a) 9.8 J
b) 1.0 J
c) 1.0 N
d) 0.98 J

For numbers 23 to 28 refer to Figure 1

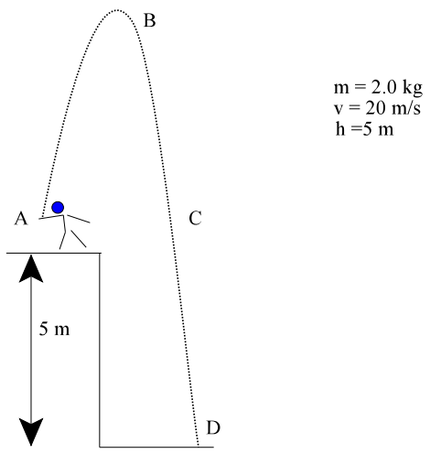


Figure 1

23. Given that the height at A is 5.0 metres, the initial velocity of the ball v_a=20.0 m/s, and the mass of the ball, m = 2.0 kg, what is the total energy of the system at "A"?

a) 5.0×10^2 J
b) 4.0×10^2 J
c) 1.0×10^2 J
d) 9.8×10^2 J

24. Select the most correct statement.

a) Speed is a maximum at C
b) Kinetic Energy at C is equal to potential energy at D
c) Total Energy at A equals total energy at D
d) Speed at B is zero

25. What is the speed of the ball at "D"?

a) 101 m/s
b) 22.3 m/s
c) 9.9 m/s
d) 0 m/s

26. Which of the following statements is true?

a) as the potential energy of the ball decreases, the kinetic energy decreases
b) as the height of the ball increases, the potential energy decreases
c) as the speed of the ball increases, the kinetic energy increases
d) both a and c are correct

27. What is the speed of the ball at point "C"?

a) 10.0 m/s
b) 20.0 m/s
c) 30.0 m/s
d) 40.0 m/s

28. At what height above "D" will the ball be at its peak?

a) 10.5 m
b) 12.8 m
c) 25.4 m
d) 20.4 m

29. If an object is resting on an incline, what can be said about the normal force?

a) It is greater than F_g
b) It is less than F_g
c) It is equal to F_g
d) None of the above

30. What do you call a transfer of energy in the form of a periodic disturbance?

a) wave
b) period
c) vibration
d) watt

31. What is amplitude?

a) maximum displacement from the rest position
b) minimum vertical distance from rest axis.
c) one full period of motion of an object.
d) a function of frequency and wavelength

32. A 0.5 m air horn produces sound with a wavelength of 1.0 m. What is the frequency produced if the speed of sound is 350 m/s?

a) 175 Hz
b) 450 Hz
c) 350 Hz
d) 700 Hz

33. Primarily, what is heard when a sound is produced by rubbing the rim of a wine glass?

a) Superposition
b) Harmonics
c) Natural frequency
d) Mechanical Resonance

34. What frequency of light will produce a wavelength of $\lambda = 8.5 \times 10^{-7}$ m?

a) 35 Hz
b) 3.5×10^{16} Hz
c) 2.8×10^{-15} Hz
d) 3.5×10^{14} Hz

35. In which medium does light travel fastest?

a) water
b) glass
c) plastic
d) air

36. How will a ray of light bend when it travels from air to water? It will:

a) bend towards the normal without changing speed
b) bend towards the normal and slow down
c) bend towards the normal and speed up
d) bend away from the normal and slow down

37. Which term applies to complete cancellation of one wave by another wave?

a) reflection
b) superposition
c) refraction
d) destructive interference

38. Why was the diffraction of light so difficult to observe?

a) the speed of light is too great
b) the wavelength of light is so small, the barrier used must be small
c) the wavelength of light is so large, the barrier used must be small
d) light does not diffract

39. What is the speed of light in glass if glass has an index of refraction of 1.46?

a) 2.00×10^{5} m/s
b) 2.05×10^{8} m/s
c) 2.05 m/s
d) 2.05×10^{5} m/s

40. Given two frequencies of 120 Hz and 122 Hz heard together, what resulting beat frequency will be heard?

a) 1.01 Hz
b) 2.00 Hz
c) 0.984 Hz
d) 14 640 Hz

1	c		6	b		11	d		16	a		21	a		26	c		31	a		36	b
2	c		7	d		12	d		17	a		22	a		27	b		32	c		37	d
3	d		8	b		13	a		18	c		23	a		28	c		33	c		38	b
4	a		9	c		14	b		19	c		24	d		29	b		34	d		39	b
5	a		10	b		15	a		20	d		25	b		30	a		35	d		40	b

Part II. Written Response [40 marks]

Kinematics

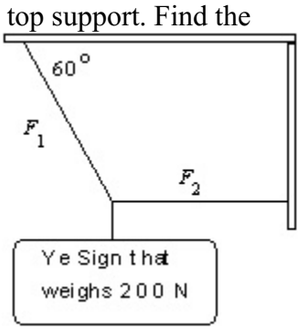
[3] 1. Car A, travelling at 20.0 m/s, passes a stationary car B. At the instant that A passes B, car B starts moving with a uniform acceleration of 2.0 m/s^2. After 15 s, what is the position of car A relative to car B? (Car A is 75 m ahead of Car B)

[3] 2. How can an object have a positive velocity but a negative acceleration? Yes. Moving in a positive direction and slowing down)

[3] 3. Bartlett wishes to fly north in her new airplane. The aircraft has a velocity of 300.0 km/h relative to the air. A wind is blowing at 20.0 km/h [E]. What is the aircraft's resultant **velocity** relative to the ground? (301 km/hr [E86.2˚N])

Dynamics

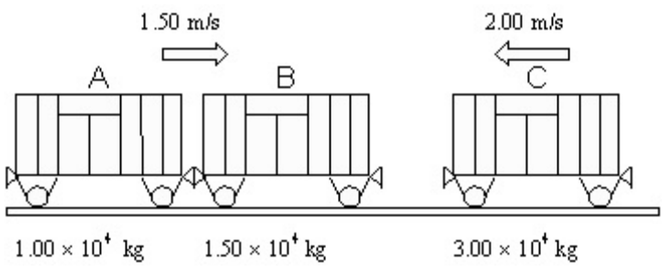
[4] 4. A sign weighing 200.0 N is held in place by two wires as shown in the picture. One wire is horizontal and the other makes an angle of 60^o with the top support. Find the tensional forces, F_1 and F_2 in the wires.



(F_1 = 231 N)
(F_2 = 115 N)

5. Two joined railroad freight cars, A and B with masses as shown in the picture, travel down a straight railroad track at 1.50 m/s. A third car C, moving in the opposite direction at 2.00 m/s on the same track collides with cars A and B and couples them.
What will be the final velocity of the combination of railroad cars A, B and C?

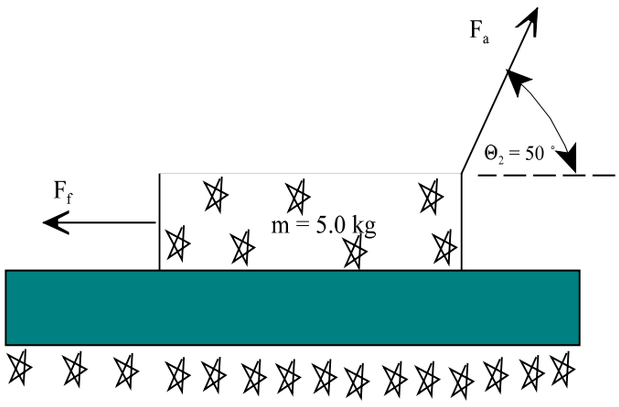
[4]



(- 0.409 m/s)

[2] 6. K-T's sled is pulled to the right as shown below. If the applied force is 60 N and the frictional force is 27 N, what is the net force in the x - direction?

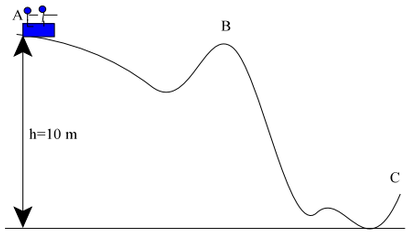
($F_{net\ x}$ = 11.6 N)



Work, Power, Energy

7. A 40.0 kg roller coaster starts from rest at a height of 10.0 m.

[3] a) What is the total mechanical energy of the system?



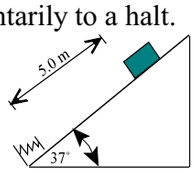
(E = 3920 J)

[3] b) What is the maximum height the roller coaster could reach at "B"? (10.0 m)

[3] c) If "C" is 2.0 m high, how fast is the roller coaster moving? (12.5 m/s)

[2] 8. A 10.0 kg mass slides from rest down a frictionless inclined plane, which makes an angle of 37º with the horizontal. After traveling 5.0 m it makes contact with a spring that is arranged along the incline. The force constant of the spring is 100 N/m. Determine the distance that the spring is compressed before the mass comes momentarily to a halt.

(2.42 m)



Waves

9. Carolyn is standing on one side of a canyon and blows her trombone. She discovers that the echo bounces off the far side of the canyon wall and returns in 1.8 s. (338 m/s)

[2] a) Assume an air temperature of 10 ˚C. Calculate the width of the canyon. (304 m)

[2] b) DESCRIBE how sound energy is transferred from its source to the listener through the air. (Blah blah blah...)

10. Light travels from crystal (n = 1.61) into air (n = 1.00) at an angle of incidence of 30˚

[2] a) Draw the resulting ray diagram. (Notes)

[2] b) Calculate the angle of refraction. (54˚)

[2] 11. Explain how light can travel in a vacuum. (Made of magnetic and electric fields. Both of these can exist in a vacuum)