PHYSICS DEPARTMENT
Second SEMESTER (2011 – 2012)

PHYSICS FOR MEDICAL AND DENTAL (0342105)

Recommended Textbook:

"Physics"

Joseph W. Kane and Morton M. Sternheim, "**Physics**", 3rd edition, John Wiley & Sons, 1988.

Recommended References:

1. Raymond A. Serway, Christ Vuille and Jerry Faughn, 8th edition, (Brooks/Cole, 200x).
2. Raymond A. Serway and John W. Jewett Jr., "**Physics For Scientists and Engineers with Modern Physics**" 7th edition, (Thomson Learning, Belmont, CA, USA, 2007).
3. David Halliday, Robert Resnick, and Jearl Walker, "**FUNDAMENTALS OF PHYSICS**", 5th edition (Wiley, New York, 1997).

Lecturers: . د.احمد مساعده ، د. محمود الجاغوب ، د. سامي . محمود ، د. محمود الحسين

Course Content:

Chapter	Content	Suggested Problems
Part 1 **6 weeks**	**Mechanics** *1.2: Displacement; Average Velocity* *1.3: Instantaneous Velocity* *1.4: Acceleration* *1.5: Finding the Motion of an Object.* *1.6: The Acceleration of Gravity and Falling Objects.*	21,23,28,34,42,45 ,49,52
	2.1: Vectors *2.2: Velocity in Two Dimension* *2.3: Acceleration in Two Dimension* *2.4: Finding the Motion of an Object.* *2.5:Projectiles (including the Supplementary Topics)* *2.6: Projectiles in Biomechanicals*	7,9,18,19,22,29,3 1,36
	3.1: Forces *3.3: Newton's First Law* *3.4: Equilibrium.* *3.5: Newton's Third Law* *3.6: Newton's Second Law* *3.7: The Significance of Newton's Laws of Motion* *3.8: Some Examples of Newton's Laws* *3.12: Friction*	29,31,42,46,52,66 ,79,101,109
	4.1: Torque *4.2: Equilibrium of Rigid Body.* *4.3: The Center of Gravity.* *4.5: Levers; Mechanical Advantage.* *4.6: Muscles.* *4.7: Levers in the Body*	7,8,11,13,17,21,4 1,51
	6.1: Work *6.2: Kinetic Energy and the Work-Kinetic Energy Theorem* *6.3: Potential Energy and Conservative Forces.* *6.4: Dissipative Forces* *6.5: Observations on Work and Energy* *6.6: Solving Problems Using Work and Energy* *6.9: Power*	6,11,15,22,37,69

Part 2 **4 weeks**	**Heat (Thermodynamics)** *10.1: Temperature Scales.* *10.2: Molecular Masses* *10.3: Pressure* *10.4: The Ideal Gas Law* *10.5: Gas Mixtures* *10.6: Temperature and Molecular Energy.* *10.7: Diffusion* *10.8 Dilute Solutions; Osmotic Pressure*	3,8,17,18,19,26,27,42,52
	11.1: Mechanical Work *11.2: The first Law of Thermodynamics*	1,2,7,8,9
	12.1: Thermal Expansion *12.2 : Heat Capacity* *12.3: Phase Change*	3,7,14,19,30,31,37
Part 3 **1.5 weeks**	**Fluids** *13.1:Archimedes's Principle (Buoyant Forces)* *13.2:The Equation of Continuity; Streamline Flow* *13.2:Bernoulli's Equation* *13.4:Static Consequence of Bernoulli's Equation* *13.5: The Rule of Gravity in Circulation* *13.6: Blood Pressure Measurements Using the Sphygmomanometer*	1,3,10,12,21,23,58
Part 4 **1.5 weeks**	**Optics and radiation Physics** *24.1: Mirrors* *24.2: Lenses* *24.3: Image Formation* *24.4: The power of a Lens; Aberrations* *24.5: The Simple Magnifier* *24.7: The Human Eye*	1, 3, 4,7, 18, 21, 33
	30.1: Radioactivity *30.2: Half-Life*	2, 3, 8, 10
	31.1: The Interaction of Radiation with Matter *31.2: Radiation Units* *31.3: Harmful Effect of Radiation* *31.5: Radiation in Medicine*	15, 17,29,40

Exams	Weight	Date of the exam
First	20 %	Tuesday, **March 20th** 2012 (5:00-6:00 PM)
Second	30 %	Wednesday, **May 2nd** 2012 (5:00-6:00 PM)
Final	50 %	To be announced later

Important dates:

* Sunday, May 20th. Last day of classes in the second semester 2011/2012

* May 22- May 29. Final Examinations.

PHYSICS DEPARTMENT

PHYSICS 105 (FIRST EXAM)

FALL SEMESTER 2011/2012 (Nov. 2nd, 2011)

Student's Name (In Arabic):.....Registration #:.....Sec#.....

Useful Information: **Some Results Are Rounded.. CONSIDER (ACCELERATION DUE TO GRAVITY) $g = 9.8\ m/s^2$**

1) The position of an object is given as a function of time as $x(t) = 10\ m + (10\ m/s)t - (5\ m/s^2)t^2$. What is the average velocity of the object between $t = 0$ s and $t = 2$ s?

A) 0 m/s B) -5 m/s C) 5 m/s D) 10 m/s E) -10 m/s

2) A graph of position as a function of time is shown in Fig. 1. During which time interval could the object be possibly moving with non-zero constant acceleration?

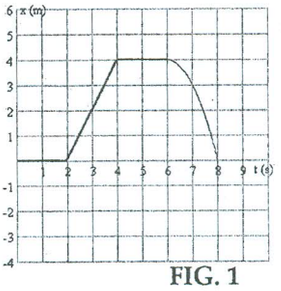


FIG. 1

A) 4.1 s to 5.9 s B) 6.1 s to 7.9 s C) 2.1 s to 3.9 s D) 0.1 s to 1.9 s
E) There is no interval that is consistent with constant non-zero acceleration.

3) Fig. 2 shows the position of an object as a function of time. What is the average speed of the object between time t = 0.0 s and time t = 9.0 s?

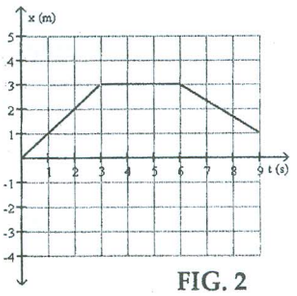


FIG. 2

A) 0.11 m/s B) -0.11 m/s C) 0.33 m/s D) 0.56 m/s E) -0.33 m/s

4) A child throws a ball with an initial speed of 8.00 m/s at an angle of 40.0° above the horizontal. The ball leaves her hand 1.00 m above the ground. What is the magnitude of the ball's velocity just before it hits the ground?

A) 6.79 m/s B) 7.45 m/s C) 9.14 m/s D) 1.22 m/s E) 4.58 m/s

5) A ball rolls horizontally off the edge of a cliff at 4.00 m/s. If the ball lands a distance of 30.0 m from the base of the vertical cliff, what is the height of the cliff?

A) 92.0 m B) 9.20 m C) 138 m D) 552 m E) 276 m

6) An object of weight *W* is in free-fall close to the surface of Earth. What is the force that the object exerts on Earth?

A) a force equal to *W* B) a force less than *W*
C) a force greater than *W* D) no force at all
E) cannot be determined without additional information

7) Two masses are connected by a string which goes over an ideal pulley (frictionless and massless) as shown in Fig. 3. Block A has a mass of 3.00 kg and can slide along a rough plane inclined 30.0° to the horizontal. The coefficient of static friction between block A and the plane is 0.400. What mass should block B have in order to start block A sliding up the ramp?

A) 2.54 kg B) 0.46 kg C) 3.20 kg D) 4.52 kg E) 14.7 kg

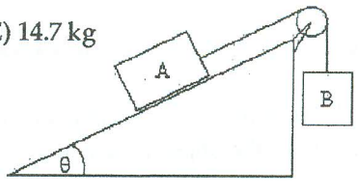


FIG. 3

8) A 5.00-kg object is initially at rest. The object is acted on by a 9.00-N force toward the east for 3.00 s. No force acts on the object for the next 4.00 s. How far has the object moved during this 7.00 s interval?

A) 35.1 m B) 29.7 m C) 21.7 m D) 8.10 m E) 53.6 m

9) A box slides down an incline tilted at an angle 14.0° above horizontal, with an initial speed of 1.70 m/s. The coefficient of kinetic friction between the box and the incline is 0.380. How far does the box slide down the incline before coming to rest?

A) 2.33 m B) 1.78 m C) 0.610 m D) 1.16 m
E) The box does not stop. It accelerates down the plane.

10) A 4.00-kg block rests between the floor and a 3.00-kg block as shown in Fig. 5. The 3.00-kg block is tied to a wall by a horizontal rope. If the coefficient of static friction is 0.800 between each pair of surfaces in contact, what minimum force must be applied horizontally to the 4.00-kg block to make it move?

A) 21.1 N B) 16.2 N C) 23.5 N D) 78.5 N E) 54.9 N

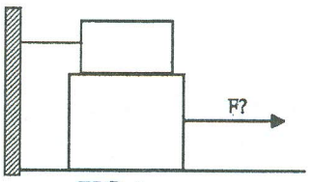


FIG. 4

List your final answers in this table using ***Capital Letters***
Only the answer in this table will be graded..

Question	Q1:	Q2:	Q3:	Q4:	Q5:	Q6:	Q7:	Q8:	Q9:	Q10:
Final Answer										

THE UNIVERSITY OF JORDAN — PHYSICS DEPARTMENT

PHYSICS 105 (2nd EXAM) — SECOND SEMESTER (Dec. 20th, 2011)

Student's Name (Arabic):..... Registration #:..... Sec #.....

Useful Information: Some Results Are Rounded. $R = 8.314$ J/(mole.K), $g = 10.0$ m/s^2 .

1) A 3.00-m long beam of negligible mass has a 30.0-kg mass at one end (A) and a 40.0-kg mass at the other end (B). How far from point (A) should a fulcrum (pivot) be placed so that the beam is balanced?

A) 1.50 m B) 1.71 m C) 2.25 m D) 1.29 m E) 0.750 m

2) Three masses are located in the x-y plane as follows: a mass of 6 kg is located at (0 m, 0 m), a mass of 4 kg is located at (3 m, 0 m), and a mass of 2 kg is located at (0 m, 3 m). Where is the center of gravity of the system?

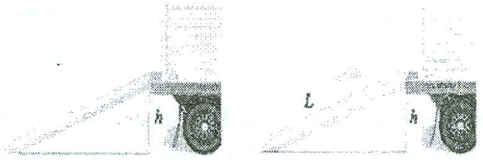
A) (2 m, 1 m) B) (1 m, 0.5 m) C) (0.5 m, 1 m) D) (1 m, 2 m) E) (1 m, 1 m)

3) A person carries a mass of 10 kg and walks along the $+x$-axis for a distance of 100m with a constant velocity of 2 m/s. What is the work done by this person? (There is NO friction)

A) 0 J B) 20 J C) 1000 J D) 200 J E) None of the other choices is correct.

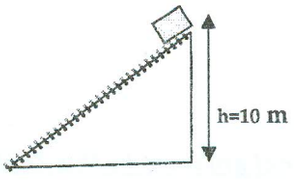
4) You need to load a crate of mass m onto the bed of a truck. One possibility is to lift the crate straight up over a height h, equal to height of the truck's bed. The work done in this case is $W1$ The other possibility is to slide the crate up the frictionless ramp of length L as shown in the figure. In this case you perform work $W2$. What statement is true?

A) $W1 = W2$ B) $W1 < W2$
C) $W1 > W2$ D) $LW1 = hW2$
E) No simple relationship exists between $W1$ and $W2$.



5) An object of mass 4 kg starts at rest from the top of a rough inclined plane of height 10 m as shown in Fig. 2. If the speed of the object at the bottom of the inclined plane is 10 m/s, how much work is done by the force of friction?

A) 100 J B) -100 J C) 200 J D) -200 J E) 0



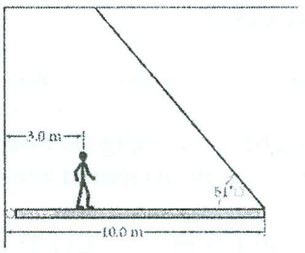
6) At what rate is a 60.0-kg boy using energy when he runs up a flight of stairs 10.0-m high, in 8.00 s?

A) 80.0 W B) 4.80 kW C) 0.0 W D) 48 W E) 750 W

7) One mole of an ideal gas has a temperature of 25°C. If the volume is held constant and the pressure is doubled, the final temperature (in °C) will be

A) 174 B) 596 C) 50 D) 323 E) 25

8) The figure shows a uniform, horizontal beam (length = 10 m, mass = 25 kg) that is pivoted at the wall, with its far end supported by a cable that makes an angle of 51° with the horizontal. If a person (mass = 60 kg) stands 3.0 m from the pivot, what is the tension in the cable?



A) 0.83×10^3 N
B) 0.30×10^3 N
C) 0.39×10^3 N
D) 0.42×10^3 N
E) 3.00×10^3 N

9) A constant volume closed container of gas is at a pressure 1.00×10^5 N/m^2 and a temperature 20°C. What is the pressure (in 10^5 N/m^2) if the temperature of the gas is increased to 60.0°C?

A) 1.14 B) 0.330 C) 0.880 D) 9.00 E) 3.00

10) How many water molecules are there in 36 g of water? Express your answer as a multiple of Avogadro's number N_A. (The molecular structure of a water molecule is H_2O.). The atomic masses of H and O are 1.008 u and 15.999 u, respectively.

A) $6N_A$ B) $2N_A$ C) $18N_A$ D) $36N_A$ E) none of the above

11) A gas consists of particles each of mass 3.00×10^{-26} kg. What is the pressure (in N/m^2) in a gas of these particles if there are 2.00×10^{25} particles per cubic meter of gas and the rms speed of the particles is 400 m/s?

A) 4.80×10^4 B) 1.60×10^4 C) 1.01×10^5 D) 9.60×10^4 E) 3.20×10^4

12) Two identical containers, A and B, hold equal amounts of the same ideal gas at the same Po, Vo and To. The pressure of A then decreases by a half while its volume doubles; the pressure of B doubles while its volume decreases by a half. Which statement correctly describes the temperatures of the gases after the changes?

A) $T_A = 0.5T_B = To$.
B) $T_B = 0.5T_A = To$.
C) $T_B = 2T_A = To$.
D) $T_A = T_B = To$.
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THE UNIVERSITY OF JORDAN — PHYSICS DEPARTMENT

PHYSICS 105 (2nd EXAM) — SECOND SEMESTER (Dec. 20th, 2011)

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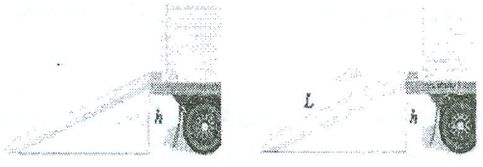

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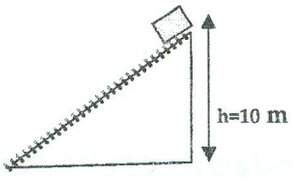
A) 100 J B) -100 J C) 200 J D) -200 J E) 0



6) At what rate is a 60.0-kg boy using energy when he runs up a flight of stairs 10.0-m high, in 8.00 s?

A) 80.0 W B) 4.80 kW C) 0.0 W D) 48 W E) 750 W

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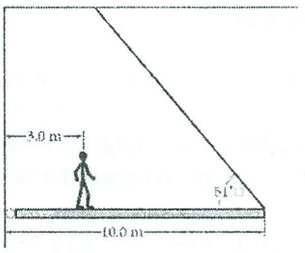
A) 174 B) 596 C) 50 D) 323 E) 25

8) The figure shows a uniform, horizontal beam (length = 10 m, mass = 25 kg) that is pivoted at the wall, with its far end supported by a cable that makes an angle of 51° with the horizontal. If a person (mass = 60 kg) stands 3.0 m from the pivot, what is the tension in the cable?



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D) 0.42×10^3 N
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A) 1.14 B) 0.330 C) 0.880 D) 9.00 E) 3.00

10) How many water molecules are there in 36 g of water? Express your answer as a multiple of Avogadro's number N_A. (The molecular structure of a water molecule is H_2O.). The atomic masses of H and O are 1.008 u and 15.999 u, respectively.

A) $6N_A$ B) $2N_A$ C) $18N_A$ D) $36N_A$ E) none of the above

11) A gas consists of particles each of mass 3.00×10^{-26} kg. What is the pressure (in N/m^2) in a gas of these particles if there are 2.00×10^{25} particles per cubic meter of gas and the rms speed of the particles is 400 m/s?

A) 4.80×10^4 B) 1.60×10^4 C) 1.01×10^5 D) 9.60×10^4 E) 3.20×10^4

12) Two identical containers, A and B, hold equal amounts of the same ideal gas at the same Po, Vo and To. The pressure of A then decreases by a half while its volume doubles; the pressure of B doubles while its volume decreases by a half. Which statement correctly describes the temperatures of the gases after the changes?

A) $T_A = 0.5T_B = To$.
B) $T_B = 0.5T_A = To$.
C) $T_B = 2T_A = To$.
D) $T_A = T_B = To$.
E) $T_B = 2T_A = To$.

List your final answers in this table. Only the answer in this table will be graded.

Question	Q1:	Q2:	Q3:	Q4:	Q5:	Q6:	Q7:	Q8:	Q9:	Q10:	Q11:	Q12:
Final Answer												

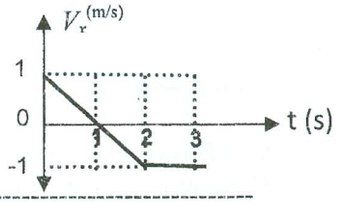
Physics Department University of Jordan	Physics 105 Final Exam	First Semester 2011/2012 10/01/2012

Student Name:	
Student Number:	**Section Number:**
Information: $R = 8.314$ J/mole.K; $k_B = 1.38\times10^{-23}$ J/K; c_P(water) = 4.2 J/g. K; c_P(ice) = 2.1 J/g. K; L_f(ice) = 333 J/g g = 9.8 m/s^2. $\rho_{water} = 1000.0$ kg/m^3 and $P_{atm} = 1.013\times10^5$ Pa.	Note: Some Results Are Rounded

1) V_x is the velocity of a particle moving along the x axis as shown. What is the total displacement of the particle (in m) at $t = 3.0$ s?

A) -1 B) -2 C) 0

D) 2 E) 1



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2) A projectile is fired from level ground at an angle of 70.0° above horizontal with a speed of 50.0 m/s. How far away from the initial position would it hit the ground?

A) 164 m B) 105 m C) 203 m D) 54.2 m E) 12.4 m

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3) Find the force (in N) exerted on the outside of a 60-cm diameter submarine window (circular) at an ocean depth of 100 m.

A) 69272 B) 305730 C) 12229215 D) 152823 E) 277089

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4) The gas in a 100-liter cylinder is compressed at 7.5 atmospheric pressure and 300 K. What is the amount of gas (in moles) in the cylinder.

A) 305 B) 30 C) 61 D) 0.61 E) 61000

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5) If water is to be pumped into a water tank at the top of a 10 m high building, what should the water pressure at the base of the building be if the speed of water is constant through the water pipe? (1 atm = 1.013 bar)

A) 1.0 bars B) 0.3 bars C) 0.5 bars D) 3.0 bars E) 2.0 bars

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6) A stone is thrown upward from the top of a building at angle 30° to the horizontal and with an initial speed of 20 m/s. If the stone is in flight for 3.0 s, how high is the building (in m)?

A) 25 B) 4 C) 10 D) 64 E) 14

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7) The temperature of 0.5 moles of an ideal gas in a rigid container is raised from 300 K to 434 K. The heat absorbed by the gas in the process (in J) is:

A) - 835.6 B) 623.6 C) 835.6 D) - 623.6 E) 0

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8) The linear expansion coefficient for Al is $\alpha = 2.2\times10^{-5}$ K^{-1}. What is the increase in area of a plate of 1 m^2 of Al if the temperature of the plate is raised by 10 °C?

A) 2.2 cm^2 B) 22 cm^2 C) 4.4 cm^2 D) 6.6 cm^2 E) 66 cm^2

9) Salt water has greater density than fresh water. A boat floats in equilibrium in both fresh water and in salt water. Which statement is correct?

A) Buoyant force excreted by salt water is greater than that by fresh water.
B) Buoyant force excreted by fresh water is greater than that by salt water.
C) Buoyant force is the same in both.
D) The volume of the displaced water is the same in both.
E) Cannot be determined from the information given.

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10) A 0.5 kg block of ice at –10 °C is heated until it is converted into water at 10 °C. What is the amount of heat absorbed in the process (in kJ)?

A) 167 B) 177 C) 198 D) 21 E) 188

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11) Oxygenation of the deep waters in a sea occurs in early winter due to:

A) Diffusion of air molecules through water.
B) Water mixing resulting from the lower density of water at lower temperatures.
C) Water mixing resulting from the higher density of water at lower temperatures.
D) The lower density of ice relative to water.
E) Water mixing resulting from turbulence and the see waves in early winter.

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12) A patient is administered (^{131}I). How long will it take for the observed radioactivity in her body to decrease to one-fourth its original magnitude? Given that (^{131}I) has physical half-life (T_p) of 8.1 days, and biological half-life (T_b) of 180 days.

A) 16.2 days B) 360 days C) 376.2 days D) 15.5 days E) 7.75 days

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13) What volume fraction of a cube of density ($\rho = 0.50$ g/cm^3) would sink under the surface of a liquid of density ($\rho_o = 1.01$ g/cm^3)?

A) 0.80 B) 0.67 C) 0.33 D) 0.50 E) 0.20

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14) An ideal gas undergoes an adiabatic expansion while doing 25 J of work. What is the change in internal energy?

A) zero B) 25 J C) -25 J D) 50 J E) -50 J

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15) The work done by an ideal gas system in an isothermal process is 400 J. What is the change in internal energy?

A) -400 J B) zero C) 200 J D) 400 J E) none of the above

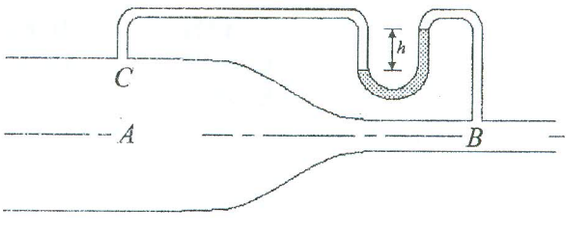
---

16) Sugar solution rises 5 m in a tree. Considering a nominal temperature of 22 °C, the concentration of sugar in the solution (in moles/m^3) is:
(Density of the Sugar solution is well approximated by that of water, 1000 kg m^{-3})

A) 29.2 B) 20.0 C) 2.0 D) 41.3 E) 10.0

17) Water flows in the horizontal pipe, shown in the Figure. At A the area is 25.0 cm^2 and the speed of the water is 2.00 m/s. At B the area is 16.0 cm^2. The fluid in the manometer is mercury, which has a density of 13,600 kg/m^3. What is the manometer reading h? (Assume that the pressure at point A and C is the same)

A) 0.546 cm B) 2.81 cm
C) 1.31 cm D) 2.16 cm
E) 3.36 cm



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18) A M = 6.00-kg block is in contact with a m = 4.00-kg block on a frictionless surface, as shown in the Figure. The M block is being pushed by a 20.0-N force toward the m block. What is the magnitude of the force of the M block on the m block?

A) 6.00 N B) 12.0 N C) 8.00 N D) 10.0 N E) 4.00 N

---

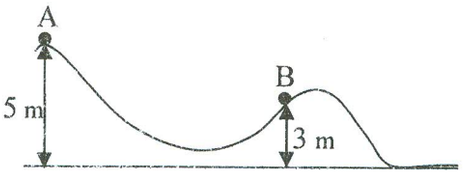
19) Water flows (streamline, nonviscous) from point a to point b in the horizontal section shown in the figure. Which of the following statements is correct regarding the velocity v, pressure P, and flow rate Q at the two ends of the section?

A) $v_a < v_b$. B) $P_a > P_b$
C) $P_a < P_b$. D) $Q_a < Q_b$ E) $Q_a > Q_b$

---

20) A small object of mass m slides along the frictionless track in the figure, staring from rest at point A. What is its speed (in m/s) at point B?

A) 6.3
B) 7.7
C) 0.0
D) 9.9
E) 4.4



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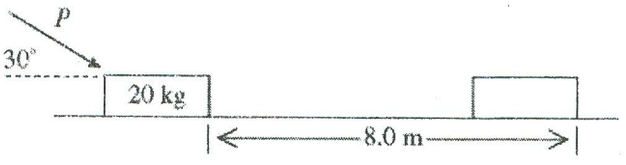
21) The absolute temperature of an object is 314 K. What is its temperature on the Fahrenheit scale?

A) 80 °F. B) 106°F. C) 96 °F. D) 47 °F. E) 91 °F.

---

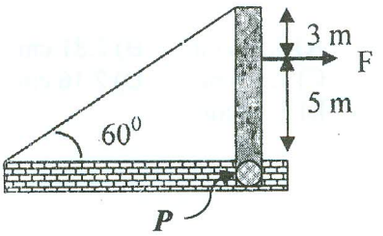
22) In the Figure, a constant external force P = 160 N is applied to a 20-kg box, which is on a rough horizontal surface. The force pushes the box a distance of 8.0 m, in a time interval of 4.0 s, and the speed changes from v_1 = 0.5 m/s to v_2 = 2.6 m/s. The work done by friction is equal to:

A) +1109 J B) +1043 J C) -1043 J
D) +1076 J E) -1076 J



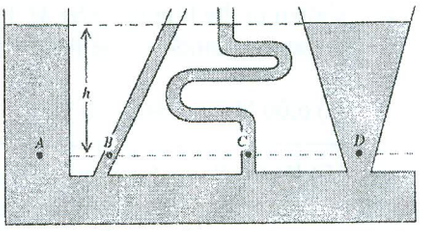
23) A uniform 100 N beam is held in a vertical position by a pin (P) at its lower end and a cable at its upper end. A horizontal force of magnitude F = 75 N acts as shown in the figure. What is the tension in the cable?

A) 47 N B) 69 N
C) 61 N D) 94 N
E) 54 N



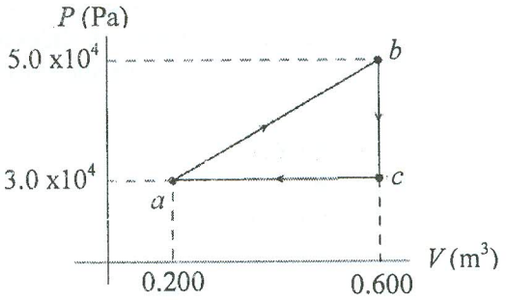
24) In the Figure, fluid fills the container shown here. At which of the indicated points is the pressure greatest?

A) A B) B C) C D) D
E) The pressure is the same at each of the labeled points.



25) In the shown Figure, the *net* work done by the gas during the close cycle is equal to:

A) 4.00 kJ B) 12.0 kJ
C) 16.0 kJ D) 20.0 kJ
E) 8.00 kJ



List your final ***answers*** *in this table.* ***Only*** *the answer in this table will be graded*

QUESTION	Q1:	Q2:	Q3:	Q4:	Q5:	Q6:	Q7:	Q8:	Q9:	Q10:	Q11:	Q12:	Q13:
Final Answer													
QUESTION	Q14:	Q15:	Q16:	Q17:	Q18:	Q19:	Q20:	Q21:	Q22:	Q23:	Q24:	Q25:	
Final Answer													

University of Jordan | **Physics (105)** | **First Semester**
Department of Physics | **(0302105)** | **2010-2011**

***Text Book*: "Physics" by Joseph Kane & Morton Sternheim
3rd Edition, 1988, New York, John Willey and Sons Inc.

Selected References:

1. "Fundamentals of Physics" by D. Halliday & R. Resnick, 4th Edition, 1993, John Willey and Sons Inc.
2. "Physics for Scientists and Engineers" by R. Serway, 5th Edition, Saunders, 2000.

Course Content:

Chapter No.	Required Sections	Suggested Problems
1	1.1-1.6	21,23,28,34,42,45,49,52
2	2.1-2.5	7,9,18,19,22,29,31,36
3	3.1-3.8, 3.12	29,31,42,46,52,66,79,101,109
4	4.1-4.3	7,8,11,13,17,21,41,51
6	6.1-6.6	6,11,15,22,37,69
7	7.1-7.4	3,4,12,15,20,26,29,30
10	10.1-10.8	3,8,17,18,19,26,27,42,52
11	11.1-11.2	1,2,7,8,9
12	12.1-12.6	3,7,14,19,30,31,37
13	13.1-13.4	1,3,10,12,21,23,58
16	16.1-16.4,16.8-16.10	5,6,9,11
17	17.1-17.5,17.12	5,11,23,31,37,43,45
30	30.1-13.2	
31	31.1-31.4	

** *Examinations:*

To be Announced Later

Lecturers:

د.احمد مساعده ، د. محمود الجاغوب ، د. سامي . محمود

THE UNIVERSITY OF JORDAN

PHYSICS DEPARTMENT — PHYSICS 105 (FIRST EXAM)

FALL SEMESTER 2010/2011 (OCT. 24th, 2010)

Student's Name (In Arabic):..... Registration #:.....

Useful Information: **Some Results Are Rounded.. CONSIDER (ACCELERATION DUE TO GRAVITY)** $\mathbf{g = 9.8\ m/s^2}$.

1. A particle moving with a constant acceleration has a velocity of 20m/s when its position is $x = 10$ m. Its position 5.0 s later is $x = -30$ m. What is the acceleration of the particle in (m/s^2).

   a) –7.3 b) –8.9 c) –11.2 d) –15 e) 8.0

---

2. A stone is projected vertically upwards from the top of a 30 m high building with an initial velocity of 20 m/s. The magnitude of the average velocity (m/s) of the stone between t = 2 s and t = 5 s is

   a) 9.8 b) 0.0 c) 34.3 d) 14.3 e) 20

---

3. A ball is kicked from the ground level at an angle of 60° to the horizontal. If the initial velocity of the ball is 20 m/s, then the speed (in m/s) of the ball at maximum height is:

   a) 0.00 b) 20.0 c) 12.5 d) 17.32 e) 10.0

---

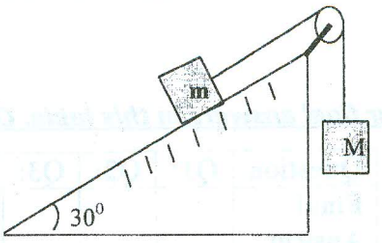
4. A firefighter 40 m a way from a burning building directs a stream of water from a fire hose at an angle of 37° above the horizontal. If the speed of the stream is 30 m/s, at what height (in m) will the water strike the building?

   a) 29.03 b) 16.48 c) 20.80 d) 1.00 e) 18.70

---

5. In the figure shown $M = 10$ kg and $m = 4$ kg. The coefficient of kinetic friction between the inclined surface and mass m is $\mu_k = 0.3$. Given that the system started from rest, find the speed (in m/s) of mass M when it has fallen a distance of 2 m.

   a) 2.96 b) 3.60
   c) 4.42 d) 3.96
   d) 2.1



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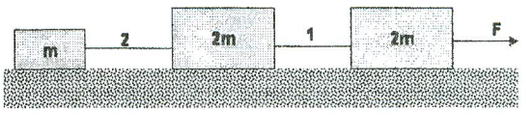
6. The horizontal surface on which the objects slide is frictionless. If $m = 2.0$ kg, and the magnitude of F is 25 N. The tension in string 2 (in N) is:

   a) 2.5 b) 0.0 c) 10.0

   d) 15.0 e) 5.0

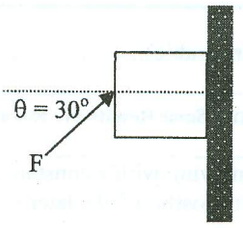


7. A 3-kg block is pushed against the wall by a force $F = 40$ N that makes a 30° angle with the horizontal. If the force is just enough to hold the block without sliding down, then the coefficient of static friction (μ_s) is equal to:

a) 0.168 b) 0.200

c) 0.271 d) 0.98

e) 0.262



8. A stone is projected with an initial speed $v_o = 10$ m/s at 30° above the horizontal from the top of a building which is 30 m high. The speed (in m/s) of the stone just before it hits the ground is

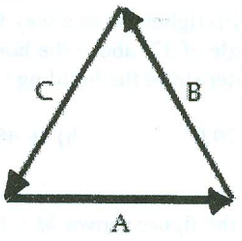
a) 26.23 b) 5.00 c) 8.67 d) 10.0 e) 0

9. A plane flies south at 500 km/h for 2h and then flies west at 500 km/h for 1 h. What is its average speed (in km/h) ?

a) 372.7 b) 500 c) 0 d) 333.3 e) 166.7

10. The diagram below shows 3 vectors all of equal length. Which statement below is true?

a) $\vec{A}+\vec{B}=\vec{A}-\vec{C}$
b) $\vec{A}+\vec{B}=\vec{B}-\vec{C}$
c) $\vec{A}-\vec{B}=2\vec{A}-\vec{C}$
d) $\vec{A}-\vec{B}=2\vec{A}+\vec{C}$
e) $2\vec{A}+2\vec{B}=2\vec{C}$



List your final answers in this table. Only the answer in this table will be graded.

Question	Q1:	Q2:	Q3:	Q4:	Q5:	Q6:	Q7:	Q8:	Q9:	Q10:
Final Answer										

THE UNIVERSITY OF JORDAN — PHYSICS DEPARTMENT

PHYSICS 105 (2nd EXAM) — SECOND SEMESTER (Dec. 5th, 2010)

Student's Name (Arabic):..... Registration #:..... Sec #.....

Useful Information: **Some Results Are Rounded.. CONSIDER (ACCELERATION DUE TO GRAVITY)** $\mathbf{g = 9.8\ m/s^2}$

1. A car traveling at 10 ms^{-1} collides with a tree. An unrestrained (لم يربط حزام الامان) passenger strikes the windshield (الزجاج الامامي) head first and comes to rest in 0.0016 s. If the mass of the passenger head is 4kg, the average force (in N) exerted on his head is:

   (a) 31250 (b) 25000 (c) 20000 (d) 50000 (e) 88500

2. A 6.0-kg object moving at 5.0 m/s collides with and sticks to a moving 2.0-kg object. After the collision the composite object is moving at 3.0 m/s in a direction parallel to the initial direction of motion of the 6.0-kg object. Determine the speed of the 2.0-kg object before the collision in (m/s).

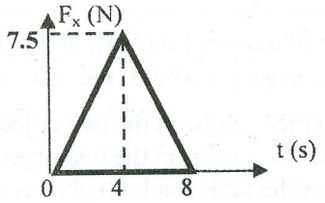
   (a) 27.0 (b) 19.7 (c) 3.0 (d) 28.3 (e) 1.5

3. A 2.5-kg object falls vertically downward in a viscous medium at a constant speed of 2.5 m/s. How much work is done (in J) by the force the viscous medium exerts on the object as it falls 8 cm?

   (a) +19.60 (b) -19.60 (c) +1.96 (d) -1.96 (e) +39.2

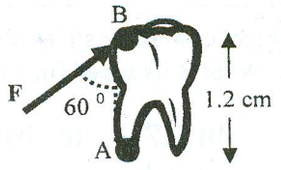
4. The force acting on a particle (m = 1 kg) in the X direction varies with time in (s) as in the Figure. If the particle starts from rest at t = 0 s, find the speed in (m/s) at t = 8.0 s.

   (a) 15 (b) 7.5 (c) 30 (d) 22.5 (e) 0.0



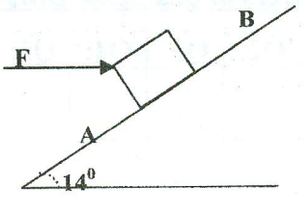
5. A steel band exerts a force of 80.0 N on a tooth at point B as in the figure. What is the torque in (N.m) on the tooth about the point A ?

   (a) 0.712 (b) 0.480 (c) 0.642
   (d) 0.0 (e) 0.831

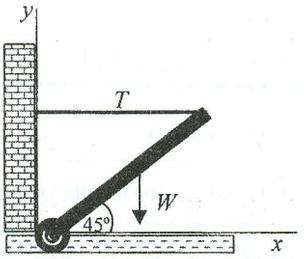


6. A 1.4 kg block is pushed up a frictionless 14^0 incline a from point A to point B which are 1.2 m apart by a horizontal force F = 6 N. If the kinetic energy at point A is 3 J and at point B it is 4 J, how much work is done on the block by the force F?

   (a) 7.2 J (b) 3.0 J
   (c) 5.0 J (d) 1.0 J
   (e) 0



7. In the figure, the weight of the rod $W = 500$ N, and its length $l = 8$ m. The rod is at equilibrium making an angle 45° with the x-axis. The tension T in the rope connecting the end of the rod to the wall is:



(a) 50 N
(b) 352 N
(c) 250 N
(d) 500 N
(e) 707 N

8. In the above question, what is the vertical component of the reaction force that acts on the rod by the hinge?

(a) 352 N (b) 500 N (c) 707 N (d) 100 N (e) 250 N

---

9. When a ball rises vertically to a height h and returns to its original point of projection, the work done on it by the gravitational force is

(a) 0. (b) $-mgh$ (c) $+mgh$. (d) $-2mgh$. (e) $+2mgh$.

---

10. An object is in static equilibrium if:

(a) It moves with a constant speed.
(b) The net external force acting on it is zero.
(c) The net torques acting on it about any axis is zero.
(d) The net internal and external forces acting on it is zero
(e) The net external force is zero, and the net external torque on it about any axis is zero.

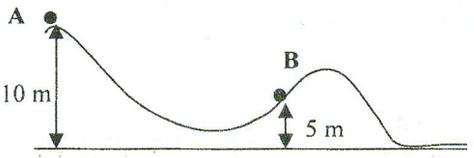
---

11. An object of mass m1 moving in the positive x – direction undergoes a head-on elastic collision with a mass m2 which is at rest. Which of the following statements is WRONG?

a) After the collision the two objects may move in opposite directions.
b) After the collision the two objects may move in the same direction.
c) After the collision both objects can be at rest.
d) Kinetic energy is conserved in this collision.
e) During the collision they act on each other with equal and opposite forces.

---

12. . A small object of mass m slides along the frictionless track in the figure, staring from rest at point A. What is its speed (in m/s) at point B?



(a) 6.3 (b) 7.7 (c) 0.0
(d) 9.9 (e) 4.4

List your final answers in this table. Only the answer in this table will be graded..

Question	Q1:	Q2:	Q3:	Q4:	Q5:	Q6:	Q7:	Q8:	Q9:	Q10:	Q11:	Q12:
Final Answer												

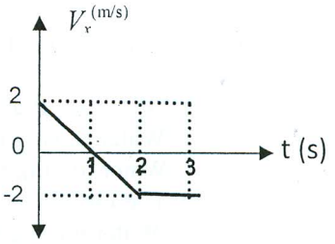
Physics Department University of Jordan	Physics 105 Final Exam	First Semester 2010/2011 9/1/2011

Student Name:	
Student Number:	**Section Number:**
Information: $R = 8.314$ J/mole.K; $k_B = 1.38\times10^{-23}$ J/K; c_P(water) = 4.2 J/g. K; c_P(ice) = 2.1 J/g. K; L_f(water) = 333 J/g,	

1. V_x is the velocity of a particle moving along the x axis as shown. What is the total displacement of the particle (in m) at $t = 3.0$ s?

(a) 2 (b) -2 (c) 0

(d) 6 (e) -6



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2. What is the number of molecules (in units of Avogadro's number N_A) in a 1.1 kg of a gas whose molecular mass is 44.0 u?

a. 1.1 N_A. b. 25 N_A. c. 0.025 N_A. d. 44 N_A. e. 40 N_A.

---

3. Find the total force (in N) exerted on the outside of a 30-cm diameter submarine window at an ocean depth of 100 m. Assume $\rho_{water} = 1000.0$ kg/m^3 and $P_{atm} = 1.013 \times 10^5$ Pa.

a. 69272 b. 76433 c. 7161 d. 152823 e. 62204

---

4. The gas in a 10-liter cylinder is compress at 15 atmospheric pressure and 300 K. What is the amount of gas (in moles) in the cylinder.

a. 3 b. 30 c. 60 d. 6 e. 6000

---

5. An ideal gas is taken from an initial (P_i,V_i,T_i) to a final state (P_f,V_f,T_f) in an *adiabatic* process. In this process:

a. $T_i = T_f$. b. $Q = W$. c. $\Delta U = Q$. d. $P_i = P_f$. e. $\Delta U = -W$.

---

6. If an ideal gas expands *isothermally*, then:

a. $Q = W$. b. $\Delta U = Q$ c. $\Delta U = -W$
d. $Q = 0$ e. The gas looses heat ($Q < 0$) in the process.

---

7. The temperature of 0.5 moles of an ideal gas in a rigid container is raised from 300 K to 400 K. The heat absorbed by the gas in the process (in J) is:

a. - 831.4 b. 831.4 c. 623.6 d. - 623.6 e. 0

---

8. The linear expansion coefficient for Al is $\alpha = 2.2\times10^{-5}$ K^{-1}. What is the increase in volume of a block of 1 m^3 of Al if the temperature of the block is raised by 10 °C?

a. 220 cm^3 b. 440 cm^3 c. 660 cm^3 d. 22 cm^3 e. 66 cm^3

9. A stone is thrown upward from the top of a building at angle 25° to the horizontal and with an initial speed of 15 m/s. If the stone is in flight for 3.0 s, how tall is the building (in m)?

a. 25 b. 14 c. 10 d. 64 e. 4

---

11. A 0.5 kg block of ice at – 5 °C is heated until it is converted into water at 10 °C. What is the amount of heat absorbed in the process (in kJ)?

a. 167 b. 172 c. 193 d. 21 e. 188

---

12. Oxygenation of the deep waters in a sea occurs in early winter due to:

a. Diffusion of air molecules through water.
b. Water mixing resulting from the lower density of water at lower temperatures.
c. Water mixing resulting from the higher density of water at lower temperatures.
d. The lower density of ice relative to water.
e. Water mixing resulting from turbulence and the see waves in early winter.

---

13. One mole of an ideal gas has a temperature of 25°C. If the volume is held constant and the pressure is doubled, the final temperature (in °C) will be

a. 174 b. 323 c. 50 d. 596 e. 25

---

14. What fraction of a cube of density ($\rho = 0.8$ g/cm^3) would sink under the surface of a liquid of density ($\rho_o = 1.2$ g/cm^3)?

a. 0.80 b. 0.67 c. 0.33 d. 0.2 e. 0.5

---

15. If water is to be pumped into a water tank at the top of a 10 m high building, what should the water pressure at the base of the building be if the speed of water is constant through the water pipe? ? (1 bar = 1.013 atm, g = 9.8 m.s^2)

a. 1.0 bars b. 2.0 bars c. 0.5 bars d. 3.0 bars e. 0.3 bars

---

16. A 12-g bullet is fired into a 3.0-kg ballistic pendulum initially at rest and becomes embedded in it. The pendulum subsequently rises a vertical distance of 12 cm. What was the initial speed of the bullet (in m/s)?

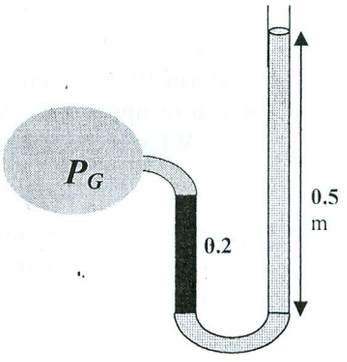
a. 768 b. 385 c. 250 d.820 e. 405

---

17. Water flows (streamline, nonviscous) from point *a* to point *b* in the horizontal section shown in the figure. Which of the following statements is correct regarding the velocity *v*, pressure *P*, and flow rate *Q* at the two ends of the section?

a. $v_a < v_b$.
b. $P_a > P_b$ since no work is done during a constant volume process.
c. $Q_a > Q_b$ (Q is the flow rate).
d. $C_P > C_V$ since no work is done during an isobaric process.
e. $P_a < P_b$.

18. The level of the fluid with density $\rho_s = 1000$ kg/m^3 in the left arm of the manometer is 0.2 m above the manometer fluid of density $\rho_f = 800$ kg/m^3 in the right arm. Which of the following relations is true?

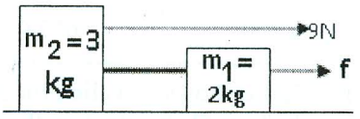


a. P_G is 2000 Pa higher than P_{atm}.
b. $P_G = P_{atm}$.
c. P_G is 2000 Pa lower than P_{atm}.
d. P_G is 4000 Pa higher than P_{atm}.
e. P_G is 6000 Pa higher than P_{atm}

---

19. Two masses (m_1=2kg, m_2=3kg) connected by a cord and m_2 pulled by a force of 9 Newton. The minimum value of "f" (in N) which is needed to keep the cord tight:

a) 6 b. 9 c.12
d) 15 e. 18



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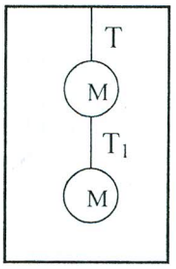
20. If two objects M_1, M_2 ($M_1 = M_2$) are connected by a light inextensible cord which is attached to the ceiling of an elevator that is accelerating upward at 2 m/s^2, the ratio T/T_1

a. 5/3 b. 2 c.1 d. 3/2 e. 0.5



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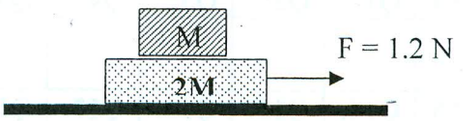
21. The frictional force between mass 2M and the surface is zero, and the frictional force between masses M and 2M causes both masses to move together when a F = 1.2 N is applied to 2M. If M = 1 kg, what is the frictional force exerted by the large block on the small block?

a. 0.4 N to the lef b. 0.8 N to the right
c. 0.4 N to the right d. 0.8 to the left
e. 1.2 to the right



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22. The absolute temperature of an object is 300 K. What is its temperature on the Fahrenheit scale?

a. 80 °F. b. 96°F. c. 106 °F. d. 47 °F. e. 90 °F.

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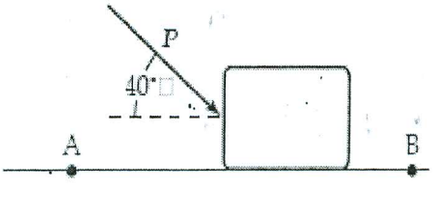
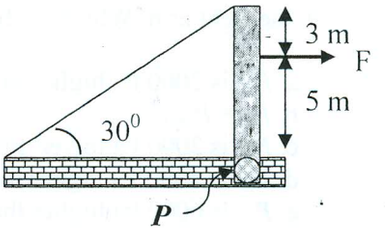
23. A block slides on a rough horizontal surface from point A to point B. A force (P = 2.0 N) acts on the block between A and B, as shown. Points A and B are 1.5 m apart. If the kinetic energies of the block at A and B are 5.0 J and 4.0 J, respectively, how much work is done on the block by the force of friction as the block moves from A to B?

a. –3.3 J b. +1.3 J c. +3.3 J
d. –1.3 J e. +4.6 J



23. A uniform 100 N beam is held in a vertical position by a pin (***P***) at its lower end and a cable at its upper end. A horizontal force of magnitude F = 75 N acts as shown in the figure. What is the tension in the cable?

a. 47 N
b. 69 N
c. 61 N
d. 94 N
e. 54 N



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24. A 3.0-kg object moving in the positive x direction has a one-dimensional elastic collision with a 5.0-kg object initially at rest. After the collision the 5.0-kg object has a velocity of 6.0 m/s in the positive x direction. What was the initial speed (in m/s) of the 3.0 kg object?

a. 6.0 b. 7.0 c. 4.5 d. 8.0 e. 5.5

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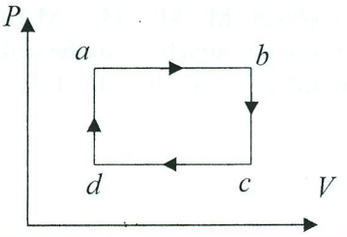
25. The figure shows a cyclic process on an ideal gas. What is the correct statement concerning the heat Q absorbed by the gas during the process indicated by the subscript?

a. $Q_{ab} < 0$; $Q_{cd} > 0$.
b. $Q_{bc} > 0$; $Q_{da} < 0$.
c. $Q_{cycle} = 0$.
d. $Q_{bc} < 0$; $Q_{da} > 0$.
e. $Q_{cd} > Q_{ab}$



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*List your final **answers** in this table. **Only** the answer in this table will be graded..*

QUESTION	Q1:	Q2:	Q3:	Q4:	Q5:	Q6:	Q7:	Q8:	Q9:	Q10:	Q11:	Q12:	Q13:
Final Answer													
QUESTION	Q14:	Q15:	Q16:	Q17:	Q18:	Q19:	Q20:	Q21:	Q22:	Q23:	Q24:	Q25:	
Final Answer													