THE UNIVERSITY OF JORDAN **PHYSICS DEPARTMENT**

PHYSICS 105 (2nd EXAM) **SEMESTER (Nov. 29th ,2016)**

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

Lecturer's Name:..... Section # .....

$g = 9.8\ m/s^2$, $\rho_{water} = 1000\ kg/m^3$, $P_0 = 1.013 \times 10^5\ Pa$, $\rho_{blood} = 1050\ kg/m^3$

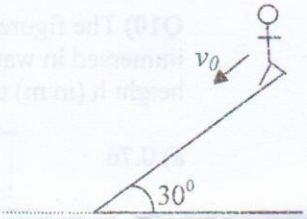
Q1) A boy lifts a 4 kg mass vertically upwards a distance of 2m at constant speed. The work (in J) done by the boy is

a) 78.4 b) 19.6 c) 39.2 d) -19.2 e) -78.4

Q2) A stone is thrown vertically upwards. Ignoring air resistance, which of the following statements is correct?

a) The sum of the kinetic and potential energies is zero.
b) As the stone rises the potential energy decreases.
c) As the stone descends the kinetic energy decreases.
d) The total mechanical energy is conserved.
e) The change in the potential energy equals the change in the kinetic energy.

Q3) A skier slides down a 30^0 inclined path as shown in the figure. He starts with an initial velocity of 6 m/s and slides down the hill a distance of 20 m. If the coefficient of kinetic friction between the ice and his skies is 0.15, determine his speed (in m/s) at the bottom of the hill.



a) 15.7 b) 17.2 c) 16.8 d) 13.5 e) 8.2

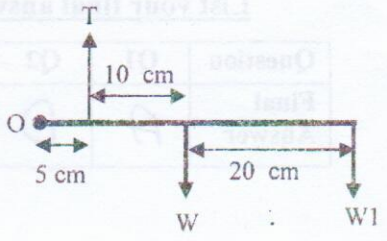
Q4) The average power output of a 60 – kg running athlete is 400 W. The work (in k J) that he does in 5 minutes is:

a) 60.0 b) 120 c) 0 d) 1.5 e) 90

Q5) The figure shows a see – saw of length L = 6 m pivoted in the middle at point O. A 20 – kg boy sits at point A and a 30 kg boy sits at point B. How far from point O (in m) should a 15 kg child sit so that the see –saw is in static equilibrium?

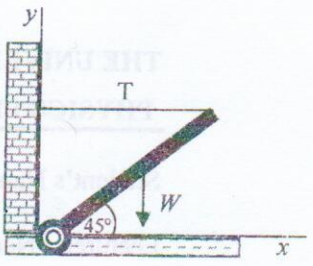
a) 2 to the right of O b) 2 to the left of O c) 1.3 to the left of O
d) 1.3 to the right of O e) at point O

Q6) The figure shows the forearm modeled as a beam kept horizontally in static equilibrium by the tension T exerted by the biceps muscle. The arm rotates about point O at the **elbow joint**. The weight of the forearm is W = 12 N. If the forearm carries a weight W1 = 15 N, calculate the tension T (in N) in the biceps muscle to keep the forearm in static equilibrium in a horizontal position.



a) 34 b) 106 c) 20
d) 12 e) 141

Q7) In the figure, the weight of the uniform beam $W = 500$ N, and its length $l = 8$ m. A massless cable holds the beam in static equilibrium at an angle of 45° with the x-axis. The **horizontal** component of the hinge force (in N) acting at the joint (point O) is:



a) 250 b) 352 c) 250

d) 500 e) 707

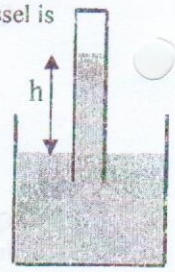
Q8) A 60 – kg man just floats in water with all of his body below the water surface. What is his volume (in m^3) ?

a) 1.2 b) 0.08 c) 0.06 d) 0.6 e) 1.0

Q9) A blood vessel of radius r splits into three vessels, each of radius $r/4$. If the velocity in the larger vessel is v, then the velocity in each of the smaller vessels is

a) $3v/16$ b) $v/3$ c) $9v/4$ d) $16v/3$ e) v

Q10) The figure shows a long **evacuated** tube with its open lower end immersed in water. The water tank is open to the atmosphere. The maximum height h (in m) the water can rise in the evacuated tube is:



a) 0.76 b) 10.3 c) 9.1 d) 3 e) 6.6

Q11) A 6.0 cm radius horizontal pipe gradually narrows down to 5.0 cm. If $P_1 = 30$ kPa and $V_2 = 6$ m/s, then the value of the pressure P_2 (in kPa) is:

a) 39.3 b) 63.5 c) 20.7

d) 209.6 e) 24.2

Q12) An object of density ρ is placed in a fluid of density ρ_F. Assume the only forces acting on the object are its weight and the buoyant force. Which of the following statements is correct?

a) The buoyant force depends on the density of the object.
b) The buoyant force is due to the increase in the fluid pressure with depth below the fluid surface.
c) If $\rho_F > \rho$, the object sinks.
d) If $\rho_F < \rho$, the object floats.
e) None of the above is correct.

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	A	D	D	B	B	E	C	C	D	B	C	B

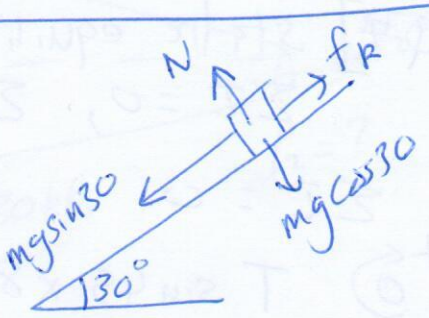
A

Physics (105)/2nd exam
Nov. 29/2016

Q1] $W_{ext} = \Delta U \Rightarrow W_{boy} = \Delta U = mgh = 4 \times 9.8 \times 2$
$= 78.4\ J$ (a)

Q2] The total mechanical energy is conserved. (d)

Q3] # mg is a conservative force
N is a non-conservative force but does NO work.
f_k is a non-conservative force and does negative work.



distance moved down the incline

$\Delta K + \Delta U = W_{nc}$

$\frac{1}{2}m(v_f^2 - v_i^2) - mgd\sin 30 = (f_k)(d)\cos 180^\circ$

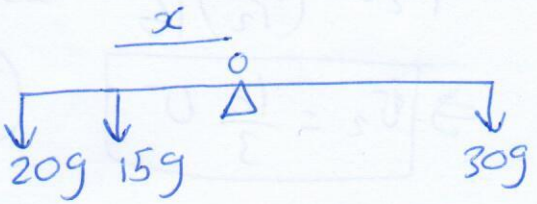
$\frac{1}{2}m(v_f^2 - v_i^2) - mgd \times \frac{1}{2} = -\mu_k(mg\cos 30)(d)$

$v_f^2 = v_i^2 + gd - \mu_k gd\sqrt{3} \Rightarrow v \simeq 13.5$ m/s (d)

Remember $\cos 30 = \frac{\sqrt{3}}{2}$

Q4] $\bar{P} = \frac{W}{t} \Rightarrow W = \bar{P}t = 400 \times 5 \times 60 = 120{,}000$
$= 120\ kJ$ [b]

Q5] 15 kg child should sit on the same side as the lighter boy i.e on the left hand side of 'O'

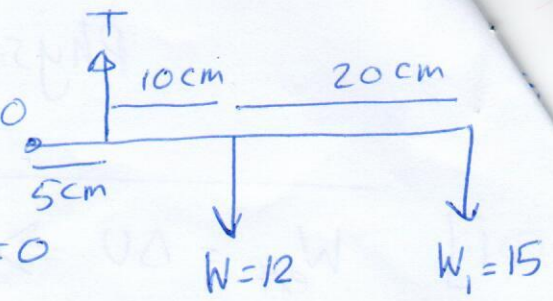


$+\circlearrowleft_O$ $20g(3) + 15gx - 30g(3) = 0$

$\Rightarrow x = 2$ m (to the left of O) (b)

Q6] static equilibrium

$\Rightarrow \Sigma \tau = 0$



$+\circlearrowleft_O \quad T(0.05) - 12(0.15) - 15(0.35) = 0$

$\Rightarrow T = 141 \text{ N}.$ (e)

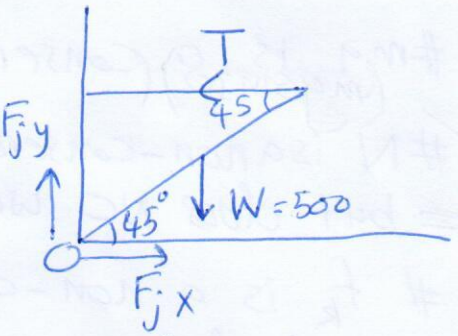
Q7] static equilibrium $\Rightarrow$

$\Sigma \tau = 0, \quad \Sigma \vec{F} = 0$

$\Sigma \tau = 0$

$+\circlearrowleft_O \quad T \sin 45 \times 8 - W \sin 45 \times 4 = 0$

$\therefore T = \frac{4W}{8} = \frac{W}{2} = 250 \text{ N}.$



$\Sigma F_x = 0$

$\rightarrow + \quad F_{jx} - T = 0 \Rightarrow F_{jx} = 250 \text{ N}.$ (c)

Q8] $F_B = mg$

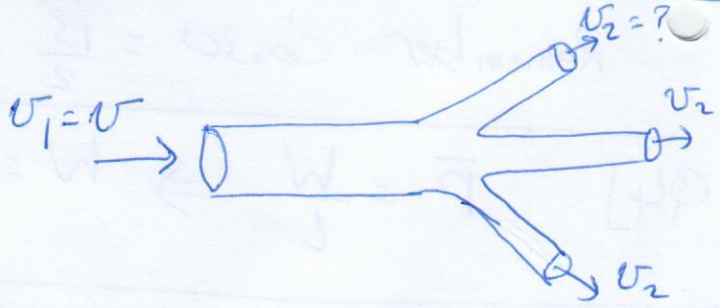
$\rho_F V g = mg \Rightarrow V = \frac{m}{\rho_F} = \frac{80}{1000} = 0.08 \text{ m}^3$

Q9] $A_1 v_1 = 3 A_2 v_2$

$\pi r_1^2 v = 3 \pi r_2^2 v_2$

$r^2 v = 3 \frac{r^2}{16} v_2$

$\Rightarrow \boxed{v_2 = \frac{16}{3} v}$ (d)



Q10] $P_{water} = P_0$ ← atmospheric pressure

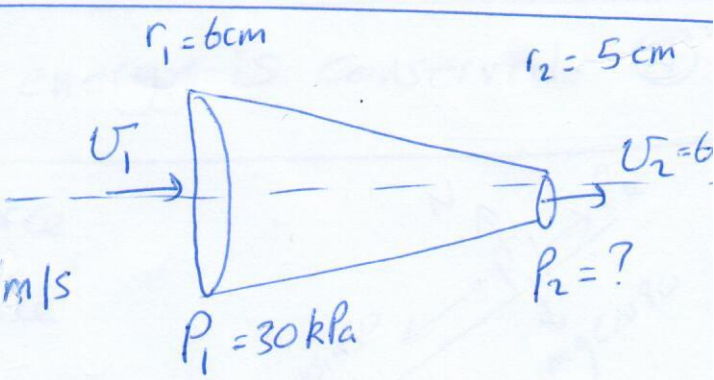
$\rho_w g h = 1.013 \times 10^5 \Rightarrow h = \dfrac{1.013 \times 10^5}{(9.8) \times 10^3} = 10.3$ m

B

Q11] $A_1 v_1 = A_2 v_2$

$\pi (0.06)^2 v_1 = \pi (0.05)^2 v_2$

$v_1 = \left(\dfrac{0.05}{0.06}\right)^2 (6) \approx 4.167$ m/s



$P_1 + \frac{1}{2}\rho v_1^2 = P_2 + \frac{1}{2}\rho v_2^2$

[remember $mgh_1 = mgh_2$ since pipe is horizontal

$P_2 = P_1 + \frac{1}{2}\rho(v_1^2 - v_2^2) = 30 \times 10^3 + \frac{1}{2} \times 1000 (v_1^2 - v_2^2)$

$= 20.7$ kPa (C)

Q12] (b)

The University of Jordan	**2nd Semester 2014/2015**
Faculty of Science	**Date: 22/4/2015**
Department of Physics	**Physics 105 - Second Exam**
Name (In Arabic):	**Instructor:**
Student Number:	**Section:**

Constants: $g = 9.8\ m/s^2$, $1\ atm = 1.013\times10^5\ Pa$, $\rho_{water} = 1.0\times 10^3\ kg/m^3$

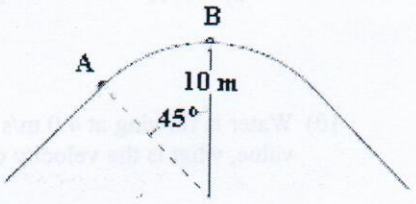
1) A 5.0-kg object is pulled along a horizontal surface at a constant speed by a 15-N force acting 20° above the horizontal. How much work is done by this force as the object moves 6.0 m?

a) 85 J b) 82 J c) 74 J d) 78 J e) 43 J

2) When a ball rises vertically to a height h and returns to its original point of projection, the work done by the gravitational force is

a) +mgh b) −mgh c) 0 d) −2mgh e) +2mgh

3) A skier weighing 0.70 kN goes over a frictionless circular hill as shown. If the skier's speed at point A is 9.2 m/s, what is his speed at the top of the hill (point B)?



a) 3.1 m/s b) 5.2 m/s c) 6.5 m/s d) 4.1 m/s e) 6.2 m/s

4) An all-terrain vehicle of 2000 kg mass moves up a 15.0° slope a distance of 48 m at a constant velocity in 8 sec. The rate of change of gravitational potential energy with time is

a) 30.4 kW b) 5.25 kW c) 24.8 kW d) 118 kW e) 439 kW

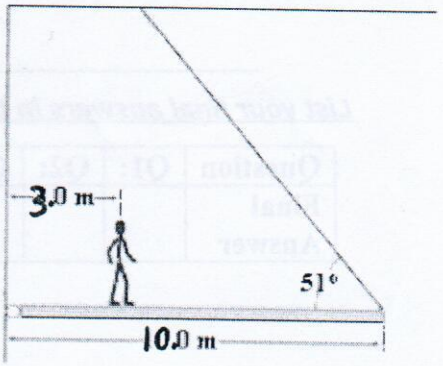
5) Find the pressure in atmospheres in the water at the base of a dam if the water in the reservoir is 200 meters deep.

a) 194 b) 24.7 c) 29.4 d) 20.4 e) 75

6) A balloon is filled with 200 m^3 of helium. How large a mass can the balloon lift while moving upward at constant speed? The density of helium 0.179 kg/m^3 and of air is 1.29 kg/m^3. Consider the mass of the skin of the balloon to be negligible. (ignore the buoyant force on the load)

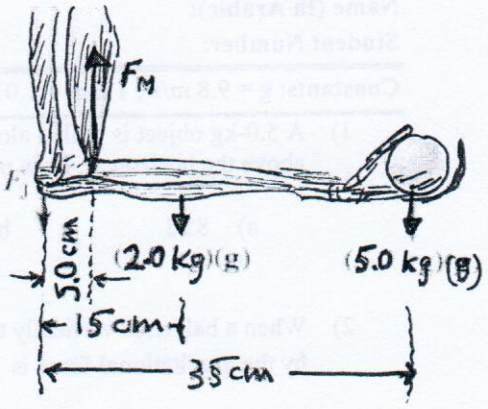
a) 115 kg b) 315 kg c) 222 kg d) 415 kg e) 37 kg

7) 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 kN b) 0.30 kN c) 0.42 kN
d) 3.0 kN e) 0.38 kN

8) How much force (F_M) must the biceps muscle exert when a 5.0-kg mass is held in the hand with the arm horizontal as in the figure. Assume that the mass of forearm and hand together is 2.0 kg and their CG is as shown.



a) 800 N b) 400 N c) 100 N
d) 200 N e) 50 N

9) What fraction of an iceberg is submerged if $\rho_{ice} = 917$ kg/m^3 and $\rho_{sea} = 1.03 \times 10^3$ kg/m^3?

a) 77% b) 89% c) 91% d) 93% e) 95%

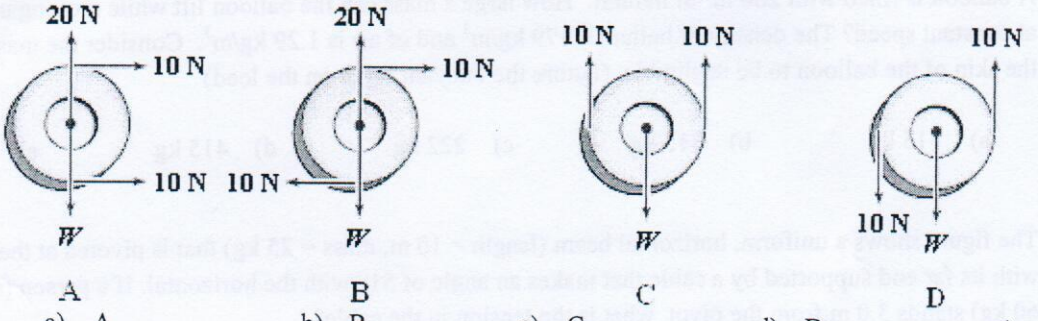
10) Water is flowing at 4.0 m/s in a circular pipe. If the diameter of the pipe decreases to 1/2 its former value, what is the velocity of the water downstream?

a) 1.0 m/s b) 2.0 m/s c) 4.0 m/s d) 8.0 m/s e) 16 m/s

11) Water pressurized to 3.5×10^5 Pa is flowing at 5.0 m/s in a horizontal pipe which contracts to 1/3 its former area. What are the pressure and velocity of the water after the contraction?

a) 4.5×10^5 Pa, 1.5 m/s b) 3.0×10^5 Pa, 10 m/s c) 3.0×10^5 Pa, 15 m/s
d) 2.5×10^5 Pa, 15 m/s e) 5.5×10^5 Pa, 1.5 m/s

12) The diagrams below show forces applied to a wheel that weighs 20 N. The symbol *W* stands for the weight. In which diagram(s) is (are) the wheel in static equilibrium? (the wheel is **NOT** pivoted)

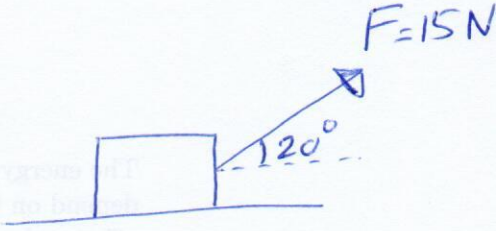


a) A b) B c) C d) D e) B and C

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:	Q11:	Q12:
Final Answer												

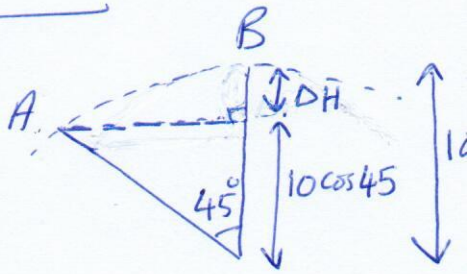
Physics for Medical and Dentistry students
Second Exam / 22/4/2015
Solutions



Q1] $W_F = (F\cos 20)(6)$

$\simeq 85$ J.

Q2] Vertical displacement $= 0 \Rightarrow W_g = 0$.



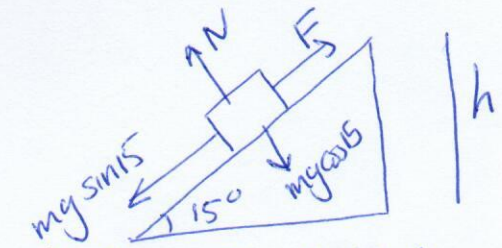
Q3] No friction $\Rightarrow \Delta K + \Delta U = 0$

$\frac{1}{2}m(v_B^2 - v_A^2) + mg\Delta H = 0$

$\Delta H = 10 - 10\cos 45 = 2.93$ m

$\frac{1}{2}v_B^2 = \frac{1}{2}(9.2)^2 - g\Delta H$

$v_B = [(9.2)^2 - 2g\Delta H]^{1/2} \simeq 5.2$ m/s



Q4] $P = Fv$

constant velocity $\Rightarrow F = mg\sin 15$

$P = (mg\sin 15)\underbrace{\left(\frac{48}{8}\right)}_{v} = (2000\times 9.8\sin 15)(6) = 30.4$ kW

Note as speed is constant all the work is converted into potential energy.

Alternatively $\Delta U = mgh = 2000\times 9.8\times(48\sin 15)$

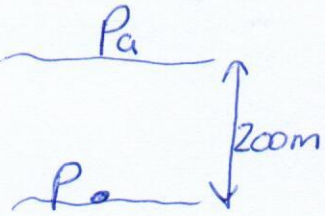
$P = \frac{\Delta U}{\Delta t} = \frac{\Delta U}{8} = 30.4$ kW.

5] $P = P_a + \rho g h$

$= 1\,atm + \frac{1000 \times 9.8 \times 200}{1.013 \times 10^5}\,atm$

$= 1\,atm + 19.35$

$= 20.4\,atm$



6] constant speed $\Rightarrow$ Dynamic equilibrium

$\Rightarrow \sum \vec{F} = 0$

$+\uparrow \quad F_B - m_{He} g - m_L g = 0$

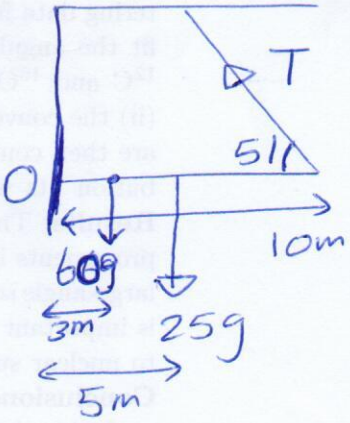
$\rho_{air} V g - \rho_{He} V g = m_L g$

$(\rho_{air} - \rho_{He}) V = m_L = 222\,kg$

7] $+\circlearrowleft_O \quad (T \sin 51)(10) - 60g(3) - 25g(5) = 0$

$T = \frac{180g + 125g}{10 \sin 51}$

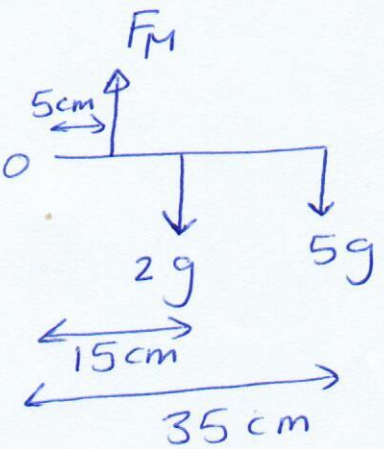
$\simeq 0.38\,kN$



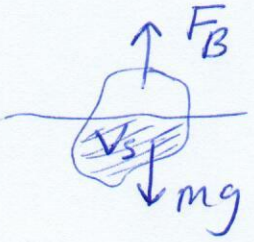
8] $+\circlearrowleft$ $F_M(0.05) - 2g(0.15) - 5g(0.35) = 0$

$$F_M = \frac{0.3g + 1.75g}{0.05}$$

$$F_M \sim 400 \text{ N}.$$



9] $F_B = mg$ static equilibrium



$$\rho_w V_s g = \rho V g$$

$$\frac{V_s}{V} = \frac{\rho}{\rho_w} = \frac{917}{1030} \sim 0.89$$

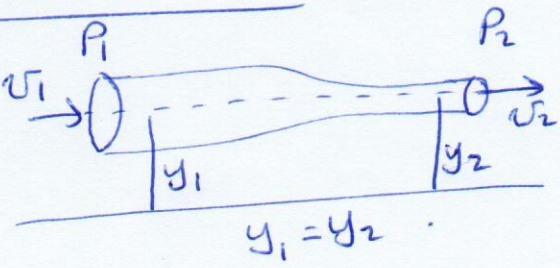
$\Rightarrow$ % submerged volume = 89%

10] $A_1 v_1 = A_2 v_2$

$$\pi\left(\frac{D_1}{2}\right)^2 (4) = \pi\left(\frac{D_2}{2}\right)^2 v_2$$

$$v_2 = \left(\frac{D_1}{D_2}\right)^2 (4) = \left(\frac{D_1}{\frac{D_1}{2}}\right)^2 (4) = 4 \times 4 = 16 \text{ m/s}$$

11] $P_1 + \frac{1}{2}\rho v_1^2 = P_2 + \frac{1}{2}\rho v_2^2$



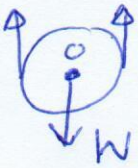
$A_1 v_1 = A_2 v_2$

$A_1(5) = \frac{A_1}{3} v_2 \Rightarrow v_2 = 15$ m/s.

$\Rightarrow P_1 + \frac{1}{2}\rho(v_1^2 - v_2^2) = P_2 \Rightarrow P_2 = 2.5 \times 10^5$ Pa.

Q12] static equilibrium $\Rightarrow \Sigma \vec{F} = 0$, $\Sigma \vec{\tau} = 0$

only diagram that satisfies both conditions is



$+\circlearrowleft$ $\Sigma \vec{\tau} = 0$

$\Sigma \vec{F} = 0$

THE UNIVERSITY OF JORDAN — PHYSICS DEPARTMENT

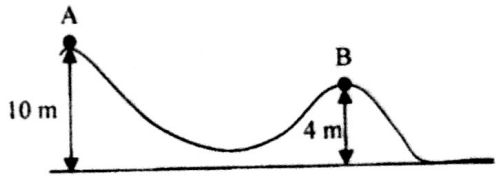
PHYSICS 105 (2nd EXAM) — SECOND SEMESTER (Dec. 8th, 2014)

Student's Name (Arabic): ... Registration #..0.1.9.2.8.7.0.

Lecturer's Name: ... Section # ...

CONSIDER (ACCELERATION DUE TO GRAVITY) g = 9.8 m/s²

Q1) A small object of mass *m* slides from rest along the frictionless track shown in the figure. The speed of the object (in m/s) at point B is:

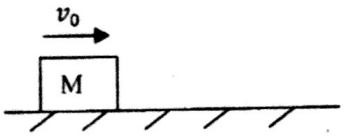


a) 8.9 b) 9.9 c) 0.0

d) 10.8 e) 4.4

F

Q2) In the figure shown, a mass M = 2 kg has an initial speed v_0 = 4 m/s and moves on a rough horizontal surface. If the mass travels a distance of 2 m before stopping, then the work done (in J) by the frictional force is



a) zero b) -8 c) -16 d) 8 e) 16

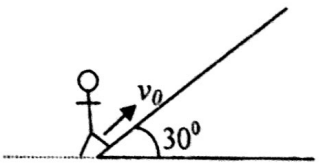
Q3) A 60 kg student climbs 30 stairs at constant speed in 10 seconds. If the height of each stair is 0.25 m, calculate the average power (in Watt) of the student.

a) 0 b) 221 c) 509 d) 370 e) 441

Q4) An object is thrown vertically upward such that it has a speed of 8.0 m/s when it reaches two thirds of its maximum height above the launch point. Its maximum height (in m) is:

a) 2.3 b) 9.8 c) 12.3 d) 16.7 e) 25.3

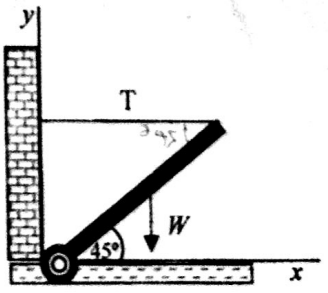
Q5) A skier starts with an initial speed v_0 = 12 m/s at the bottom of a steady upward 30° inclined plane. If the coefficient of kinetic friction is 0.15, determine the distance (in m) he moves up the inclined plane before coming to rest.



a) 23.3 b) 14.7 c) 11.7

d) 12.9 e) 8.4

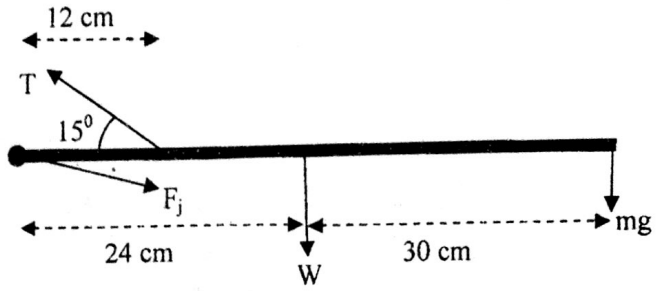
Q6) In the figure, the weight of the uniform beam *W* = 500 N, and its length *l* = 8 m. A massless cable holds the beam in static equilibrium at an angle of 45° with the *x*-axis. The **horizontal** component of the hinge force (in N) acting at the joint is:



a) 250 b) 352 c) 50

d) 500 e) 707

Q7) The figure models a human arm, carrying a mass m = 1.0 kg, held horizontally in static equilibrium. The force exerted by the deltoid muscle is T, while the reaction force at the joint is F_j. If the weight of the arm W= 35 N, determine the tension T (in N) that the deltoid muscle must exert to keep the arm in static equilibrium.



a) 118 b) 441 c) 14 d) 354 e) 204

Q8) A ship floating in sea displaces 1000 m^3 of seawater . Assuming the density of seawater to be 1020 kg/m^3 calculate the mass (in 10^6 kg) of the ship:

a) 5.10 b) 7.60 c) 1.02 d) 9.80 e) 4.90

Q9) A blood vessel of radius r splits into two vessels each with radius $r/2$. If the velocity in the larger vessel is 2 m/s, then the velocity in each of the smaller vessels is

a) 2.0 b) 4.0 c) 1.0 d) 8.0 e) 0.5

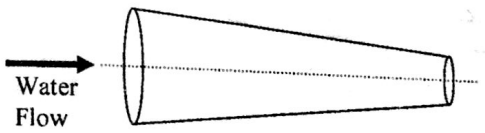
Q10) The difference in blood pressure between the feet and head of a person standing vertically is120 mmHg. The height of this person (in m) is (density of blood = 1050 kg/m^3, 1mmHg = 133 Pa)

a) 1.90 b) 1.32 c) 1.75 d) 1.55 e) 1.80

Q11) A spherical balloon has a radius of 4 m. The balloon is filled with a certain gas and floats in equilibrium in air while carrying a mass of 200 kg. Calculate the mass (in kg) of the gas inside the balloon knowing that the density of air is 1.29 kg/m^3 (Ignore the mass of the skin of the balloon and the buoyant force on the 200 kg mass).

a) 146 b) 68 c) 166 d) 200 e) 129

Q12) A 4.0 cm radius horizontal pipe gradually narrows down to 2.0 cm. When water flows in this pipe the pressure in these two sections is 32.0 kPa and 24.0 kPa , respectively. What is the rate of flow of water in the pipe (in Liters/s)? ($1m^3$ = 1000 Liters)



a) 3.6 b) 1.3 c) 26.8

d) 7.1 e) 5.2

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	d	c	e	b	a	a	b	c	b	d	a	e

27.5/30 V. Good

30
30

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?

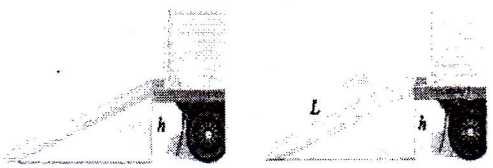
A) (2 m, 1 m), B) (1 m, 0.5 m) C) (0.5 m, 1 m) D) (1 m, 2 m) E) (1 m, 1 m)

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.

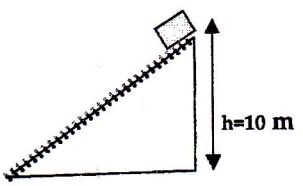
4) You need to load a crate of mass m onto the bed of a truck. One possibility is to lift the crate straight up over a height h, equal to height of the truck's bed. The work done in this case is $W1$ The other possibility is to slide the crate up the frictionless ramp of length L as shown in the figure.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



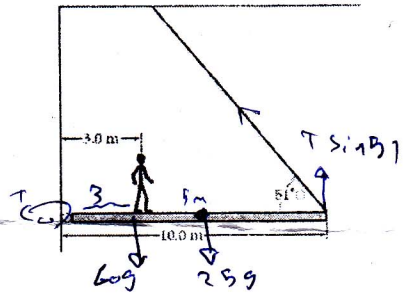
6) At what rate is a 60.0-kg boy using energy when he runs up a flight of stairs 10.0-m high, in 8.00 s?

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

$PV = \frac{2}{3} N \left(\frac{N_0}{N_A}\right) K_{AV}$

$v_{rms} = \sqrt{\frac{2K_{AV}}{m}}$

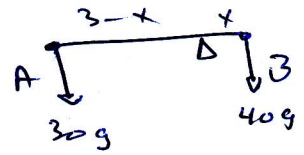
12) Two identical containers, A and B, hold equal amounts of the same ideal gas at the same Po, Vo and To. The pressure of A then decreases by a half while its volume doubles; the pressure of B doubles while its volume decreases by a half. Which statement correctly describes the temperatures of the gases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

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

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	B	B	A	A	D	E	D	C	A	B	E	D

1)



$(30g)(3-x) = (x)(40g)$

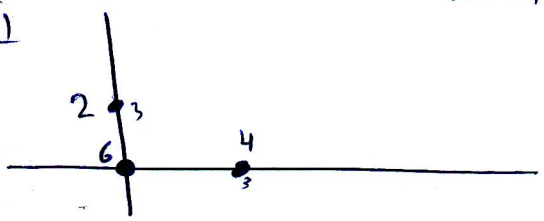
$2.25 - 0.75x = x$

$x = 1.28$, from B

* from A $\Rightarrow$ 1.71

---

2)



$X = \frac{0+0+(4)(3)}{12} = 1$

$y = \frac{0+0+(2)(3)}{12} = 0.5$] (1, 0.5)

---

3) $W = \Delta K$

$\Delta K = 0$, constant velocity

$\therefore W = 0$

---

4) $W_1 = W_2$

* work don't depend on Path (Conservative force)

---

5) $\Delta K + \Delta U = W_{nc}$

$(\frac{1}{2})(4)(100) - 0 - (4)(9)(10) = W_{nc}$

$W_{nc} = f_{force} = -200$

---

6) rate $\Rightarrow$ Power

$P = Fv = (60)(10)(\frac{10}{8})$

$= 750\ W$

---

7) $\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$ *T in kelvin

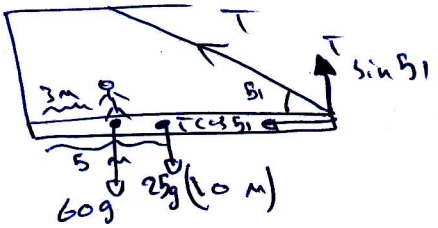
$\frac{P_1}{298} = \frac{2P_1}{T_2}$ $\quad 2P_1 = P_2$

$T_2 = 596\ K^\circ$

$T_2 = 323\ C^\circ$

---

8)



$\sum \tau = 0$

$(T \sin 51)(10) = (60g)(3) + (25g)(5)$

$T = 390 = 0.39 \times 10^3\ N$

---

9) $\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$

$\frac{(1 \times 10^5)}{293} = \frac{P_2}{333}$

$P_2 = 1.136 \times 10^5$

$\approx 1.14 \times 10^5$

---

10) $n_0 = n A v$

$= 2Av$

---

11) $PV = \frac{2}{3} n N_A k_{av} = \frac{2}{3} n k_{av}$

$v_{rms} = \sqrt{\frac{2k_{av}}{m}}$

$(400)^2 = \frac{2k_{av}}{3 \times 10^{-26}}$

$k_{av} = 2.4 \times 10^{-21}$

$P = (\frac{2}{3})(\frac{(2 \times 10^{25})(2.4 \times 10^{-21})}{1})$

$P = 3.20 \times 10^4$

---

12) A قل الضغط زاد الحجم

B زاد الضغط قل الحجم

كلو بظل قل ماعدا

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 0.002 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 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 opposite 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).

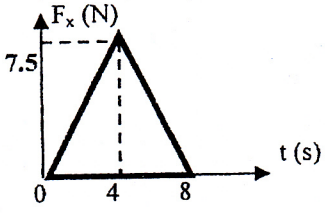
(a) 27.0 (b) 19.7 (c) 3.0 (d) 28.3 (e) 1.5

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 80 cm?

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

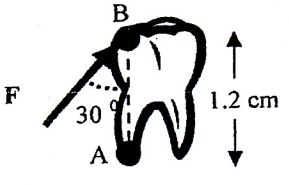
4. The force acting on a particle (m = 2 kg) in the X direction varies with time in (s) as in the Figure. If the particle starts from rest at t = 0 s, find the speed in (m/s) at t = 8.0 s.

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



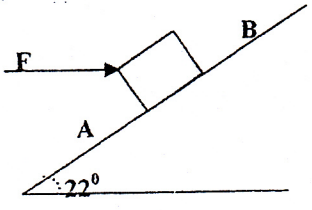
5. A steel band exerts a force of 80.0 N on a tooth at point B as in the figure. What is the torque in (N.m) on the tooth about the point A ?

(a) 0.012 (b) 0.480 (c) 0.642
(d) 0.0 (e) 0.831



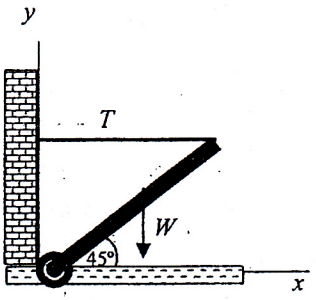
6. A 1.4 kg block is pushed up a frictionless 22° incline from point A to point B which are 1.2 m apart by a horizontal force F = 6 N. If the kinetic energy at point A is 3 J and at point B it is 4 J, how much work is done (in J) on the block by the force F?

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



7. In the figure, the weight of the rod $W = 1000$ N, and its length $l = 10$ 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) 100 N
(b) 500 N
(c) 707 N
(d) 1000 N
(e) 1414 N



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

(a) 100 N (b) 500 N (c) 707 N (d) 1000 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) $+mgh$. (b) $-mgh$ (c) 0. (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 external force is zero, and the net external torque on it about any axis is zero.
(e) The net internal and external forces acting on it is zero

---

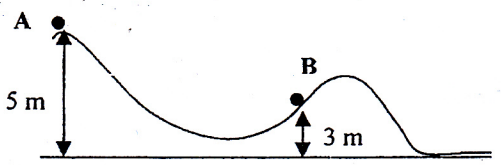
11. An object of mass m1 moving in the positive x – direction undergoes a head-on elastic collision with a mass m2 which is at rest. Which of the following statements is WRONG?

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) Kinetic energy is conserved in this collision
d) After the collision both objects can be at rest
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, starting 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												

d

12) $V_i = 0$

$\Delta K + \Delta U = 0$

$\frac{1}{2} m V_f^2 - 0 - mg2 = 0$

$V_f = 6.26 \approx 6.3$

≈ Model Answers ≈

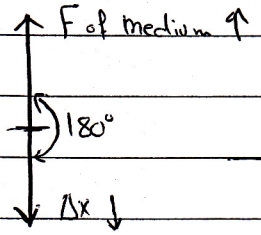
~ Physics 2nd Exam ~

3	4	5	6	7	8	9	10	12
B		B	A	B	B	C	D	A

③ $m = 2.5\ kg$ $U = \underbrace{2.5}_{\text{"constant"}}$ $\Delta x = 80\ cm = 0.8\ m$.

→ $W = F\,\Delta x = (mg)\,\Delta x = 2.5 \times 9.8 \times 0.8 = 19.6\ J$

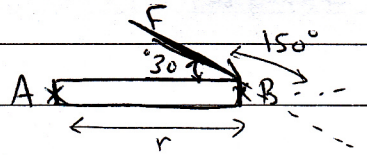
"This is the work done by the object on the medium"



→ $W = -19.6\ J$

"This is the work done by the medium on the object".

⑤ $F = 80\ N$ $\Pi = ?$ Pivot ≡ A $r = 1.2 \times 10^{-2}\ m$.



$\Sigma \Pi = F \times r \times \sin 150 = 80 \times 1.2 \times 10^{-2} \times \frac{1}{2}$

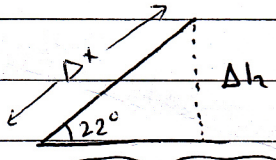
$\Sigma \Pi = 0.480\ N.m.$

⑥ $m = 1.4\ Kg$ $\theta = 22°$ $\Delta x_{AB} = 1.2\ m$ $\Delta K_{A\to B} = 4 - 3 = 1\ J$

$\Delta E = W^a$

$\Delta U + \Delta K = W^a$

$mg(\Delta h) + 1 = W^a$

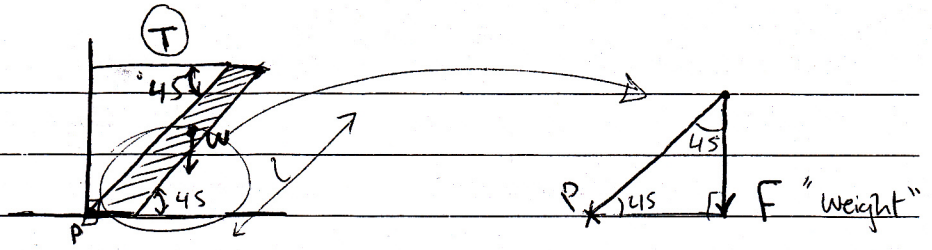


→ $\Delta h = \Delta x \sin 22$

→ $1.4 \times 9.8 \times (\Delta x \sin 22) + 1 = W^a$

$W^a = 1 + 6.2 \rightarrow W^a = 7.2\ J$

(7)



In Equilibrium → $\Sigma \tau = 0$

→ $T \times L \times \sin 45 - W \times \frac{L}{2} \times \sin 45 = 0$

→ $T L \sin 45 = W \frac{L}{2} \sin 45$

$T = \frac{W}{2} = 500\ N.$

(8) Since it's in Equilibrium: → $\Sigma F = 0 < \begin{matrix} \Sigma F_x = 0 \\ \Sigma F_y = 0 \end{matrix}$

→ $\Sigma F_x = 0 \rightarrow H_x - T = 0$

$H_x = T$

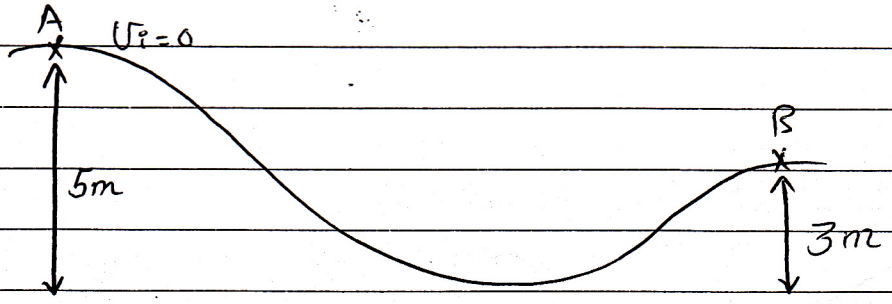
So: $H_x = 500\ N$

(9) going up : $W = mgh$

going down : $W = -mgh$

$\Sigma W = 0$!

(12)



$v_i = 0 \rightarrow K_i = 0$

→ Since no force but the object's weight exerts on it :

$\Delta E = 0 \rightarrow \Delta U + \Delta K = 0$

$U_i + K_i = U_f + K_f$

$mgh_i = mgh_f + \frac{1}{2} m v_f^2$

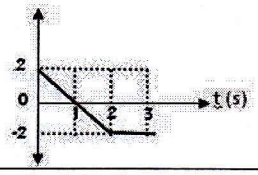
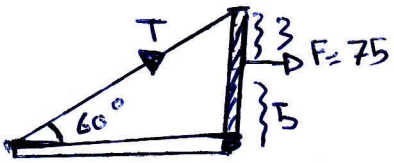
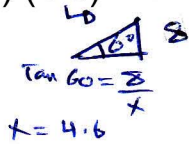
$9.8 \times 5 = 9.8 \times 3 + \frac{1}{2} v_f^2$

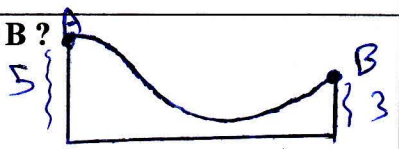
$v_f^2 = 2 \times 9.8 (5-3) = 39.2 \rightarrow v_f = 6.3\ m/s$

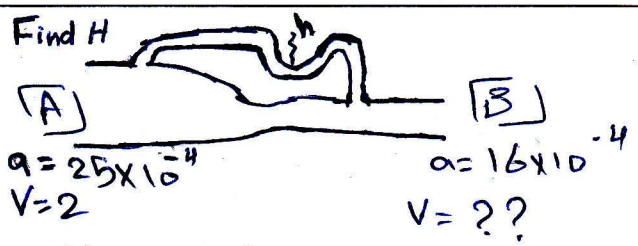
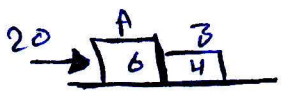
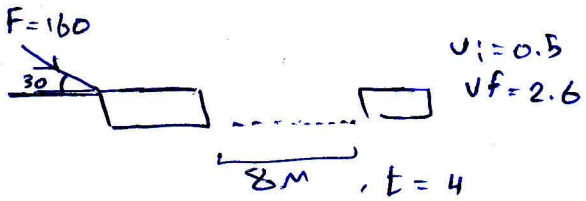
Physics , final exam 2011

Notes :

*** these questions was written by students just after the exam and answered by them , so there maybe some mistakes and we apologize for this ..**
*** the exam was 25 qus , and we only could remember 23 ..**

1-	**find the displacement :** 	
2-	**what is the correct about the following tube :** 	Pa < Pb
3-	**the net work :** 	area under curve
4-	**find the torque :** 	(5)(75)=T(sin 60) (4.6) T = 94 
5-	Find the pressure at the bottom of a building which high is 10 m , if we bummbed the water in a constant velocity ? 1 atm = 1.013 bars	
6-	**isothermal system means :**	**internal energy change is = 0**
7-	**abadiatic system means :**	**internal energy change is " – w "**
8-	**عنصر اليود يعني I , biological half life is 180 … physical half life is 81 ..in the human body .. to be ¼ , how much does it need ??**	**15.5**
9-	**if sea water density is grater than the water density … then a boat in the sea water will :**	**no change at all (check ur doctors to be sure)**
10-	**find the range** theta = 70 v. = 15	$R = \frac{V_o^2 \sin 2\theta}{g}$

11-	**oxygenation in water due to :**	**Mixing of water , lower T , lower density**
12-	**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**	
13-	**sap rises 5 meter … find C ??!**	$h = \frac{\pi}{\rho g}$, $\pi = CRT$ + وفي الامتحان تعطى ρ و g و R و T
14-	**K = 314 .. find the tempreture in f ?!**	$C = K - 273 \Rightarrow C = 41$ $F = \frac{9}{5}C + 32 = 105.8$
15-	**p = 7.5 , T = 22 .. V = 100** **Find n ?!?**	$n = \frac{PV}{RT}$
16-	**find the velocity at B ?** 	$V = \sqrt{2gh} = \sqrt{(2)(9.8)(2)}$ $= 6.3$
17-	**find the volume fraction submerged .. if density = 0.5**	$\rho = 0.5$, $\rho = 1.01$ (من السؤال) $\frac{0.5}{1.01} = 0.5$
18-	**find the delta Q absorbed** **If :** **T changed from – 10 to 10** (we don't remmebr the numbers , but the way to solve this question is :)	1 - from -10 to 0 Q = (M ice) (S ice) (delta T) 2 - in zero Q = M ice L 3 - from 0 to 10 Q = (M all) (S water) (delta T)

19-	Find H  	1 - Find V at B (a)(v) = (a)(v) 2 - find P by bernoli equation 3 - Pa - Pb = (rho) g h * rho is density ! answer was : 21 .6 cmbb
20-	**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**	
21-	what is the force that particle A affect particle B by ?!  	8 N
22-	 Find ΔK ?	① Find a ② ΔK = Kf - Ki -1043