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THE UNIVERSITY OF JORDAN PHYSICS DEPARTMENT

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

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Useful Information: Some Results Are Rounded. $R = 8.314$ J/(mole.K), $g = 10.0$ m/s^2 . وقت المحاضرة : ١١-١٠

اسم الدكتور : محمود الجاغوب

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)

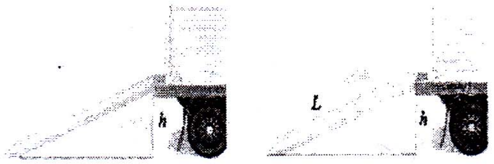
3) A person carries a mass of 10 kg and walks along the $+x$-axis for a distance of 100m with a constant velocity of 2 m/s. What is the work done by this person? (There is NO friction)

$\Delta K = W_{total}$

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

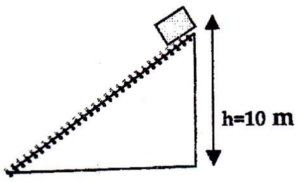
4) You need to load a crate of mass m onto the bed of a truck. One possibility is to lift the crate straight up over a height h, equal to height of the truck's bed. The work done in this case is $W1$ The other possibility is to slide the crate up the frictionless ramp of length L as shown in the figure.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



Power

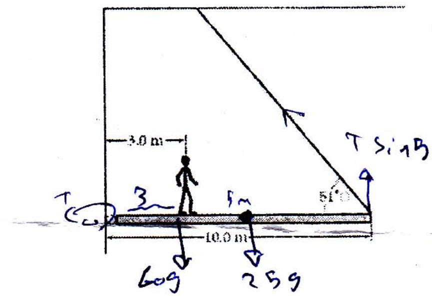
6) At what rate is a 60.0-kg boy using energy when he runs up a flight of stairs 10.0-m high, in 8.00 s?

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?

$Pv = \frac{2}{3} n_0 N_a K_{av}$

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

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

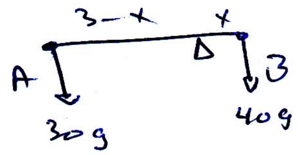
12) Two identical containers, A and B, hold equal amounts of the same ideal gas at the same Po, Vo and To. The pressure of A then decreases by a half while its volume doubles; the pressure of B doubles while its volume decreases by a half. Which statement correctly describes the temperatures of the gases 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	B	B	A	A	D	E	D	C	A	B	E +08	D

1)



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

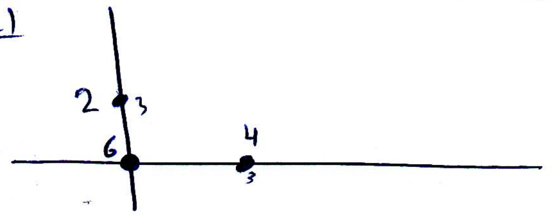
$2.25 - 0.75x = x$

$x = 1.28$, from B

* from A ⇒ $\boxed{1.71}$

2)

(X, y)



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

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

(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)

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

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

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

6) rate ⇒ Power

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

$= 750\ W$

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

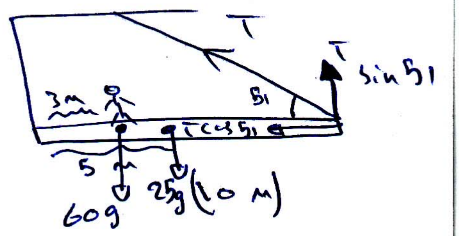
$2P_1 = P_2$

$\frac{\cancel{P_1}}{298} = \frac{2\cancel{P_1}}{T_2}$

$T_2 = 596\ K°$

$T_2 = 323\ C°$

8)



$\sum \tau = 0$

$(T \sin B1)(10) = (60g)(3) + (25g)(5)$

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

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

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

$P_2 = 1.136 \times 10^5$

$\simeq 1.14 \times 10^5$

10) $N_0 = n A v$

$= 2 A v$

11) $PV = \frac{2}{3} n N_A k_{av} = \frac{2}{3} n_0 k_{av}$

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

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

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

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

$P = 3.20 \times 10^4$

12)

A: قل الضغط / زاد الحجم ما اطار كان قبل ماهو

B: زاد الضغط / قل الحجم ما اطار

كلو بظل قبل ماهو