12-11-13

P2A

MAP sample final

Exam to fall '13

quizzes.

sample final ↓

Ch 13, 14, 15, 16, 11.

need ch 12.

Final:
CH 11 → 16 (6 chapters)

+ one or two
problems from

TEST 1, 2 or 3.

list of final links
(1) 12-9-13 ; ch 15, 16

5 sheets (10 sides) allowed.

see link at www.nvaphysics.com to
final exam schedule

Sample Exam Ch 11

(#1) Ch 13 —MAP→ mastering # 29, 31, 32, 35, 36.

(1.)

(a.) ↑

(b.) ↓

(c.) ↓

(d.) $0 = B - T - mg$

$T = B - mg$

$B = \rho_w \cdot V \cdot g$

$B = (1000) \cdot V \cdot g$ ← 9.8

$\rho_w = 1000 \frac{kg}{m^3}$ $\frac{kg}{m^3}$ $\frac{m}{s^2}$

$m = \rho \cdot V$

V is given,

ρ is given = object density

S. FINAL

CH13 online quiz

(#2) CH13 —MAP→ #42, 50, 73, 51;

(a.) (b.) } $A = \pi r^2 = \frac{\pi d^2}{4}$

(c.)

$A_1 v_1 = A_2 v_2$

$\Rightarrow v_2 = \frac{A_1 v_1}{A_2}$

$v_1 = 0.5 \, m/s$

(d.) $P_1 + \frac{1}{2}\rho v_1^2 + \rho g y_1$

$= P_2 + \frac{1}{2}\rho v_2^2 + \rho g y_2$

$\Rightarrow P_1 - P_2 = \frac{1}{2}\rho(v_2^2 - v_1^2)$

$\boxed{v_2 > v_1} \Rightarrow P_2 < P_1$

#3 CN14 — MAP / Expansion → BOOK (& online) 11, 17, 8, 15, 14, 16;

↓

OVERFLOW (expansion theme)

$$\Delta V_l - \Delta V_g = \Delta V_{FLOW}$$

↑ overflow Volume

$$V_0 \cdot (\beta_l - \beta_g) \cdot \Delta T = \Delta V_{FLOW}$$

#4. CN14 — MAP → 42, 44, 47, 48;

#4. CH14 —MAP→ 42, 44, 47, 48.

a. c_i = specific heat of ice

m_i = ice mass → ice mass

$$m_i \cdot c_i \cdot (0-(-10)) + m_i \cdot L_f + m_i \cdot c_w \cdot (55-0)$$

↑ MELTING

b.

MELTING ↓ ← heat of fusion of H_2O (MELT OR FREEZE)

$$m_i \cdot c_i (0-(-10)) + \frac{m_i \cdot L_f}{2}$$

#5. CH15 —MAP→ CH 15: 47, 80, 79 ← SYNTHESIS

"WHAT IF?" → CH16

Engines: # 7, 8

CH16

Carnot: # 22, 23

Device

#5) ch15

a)

$V_a = ?$

convert $1 atm = 1.013 \times 10^5 Pa$

$1.013 \to 1.000$; $Pa \to N/m^2$

$$\frac{P_a V_a}{\cancel{T_a}} = \frac{P_c V_c}{\cancel{T_c}} \rightarrow V_a = \frac{P_c \cdot V_c}{P_a}$$

note: $\frac{P_a V_a}{T_a} = nR$ ⇒ get T_a.

#5

(b.) $T_a = T_c = \dfrac{P_a V_a}{nR}$

$n = 0.0040$ moles

$T_b = ?$

$$\frac{P_b V_b}{T_b} = \frac{P_a V_a}{T_a}$$

FIND T_b:

CHECK

PART (a) { P_a? ✓, V_a? ✓ }

$\dfrac{P_a V_a}{nR} \Leftarrow$ ⟵ T_a? ✓

S Final

(#5.) ⟶ (8)

$\Delta Q = \Delta U + W$.

ALSO $\Delta Q_{cycle} = W_{cycle}$.

$\Delta U_{cycle} = 0$.

(c)

(i) $\Delta Q_{a \to b} = \Delta U$ since $W = 0$

$$U = \frac{3}{2} nRT$$

$$\Delta U = \frac{3}{2} nR(T_b - T_a) > 0$$

KNOWN

$n = 0.0040$ moles

(d)

(ii) CONSTANT PRESSURE

$\Delta Q_{b \to c} = \Delta U + W \leftarrow P \cdot \Delta V = nR\Delta T$ Boyle's LAW

Note: $\Delta Q_{b \to c} < 0$

$\Delta Q_{b \to c} = nC_p \Delta T \Rightarrow C_p = C_v + R$

$C_v = \frac{3}{2} R$

→ T = CONSTANT.
Isothermal : $\Delta U = 0$ since $\Delta T = 0$ a

(e) (iii) $\Delta Q_{c\to a} = \Delta U + W$

$$\Delta Q_{c\to a} = W_{c\to a}$$

$$W_{c\to a} = nRT \cdot \ln \frac{V_a}{V_c}$$

↕ calculus

$T_c = T_a$

(f.) $\Delta U_{a\to b} = \frac{3}{2} nR(T_b - T_a)$

(g) $\Delta U_{b\to c} = \frac{3}{2} nR(T_c - T_b)$

note: $T_a = T_c$

(11.) $\Delta U_{c \to a}$

2 METHODS

(A) $\Delta U_{cycle} = 0$

$0 = \Delta U_{a \to b} + \Delta U_{b \to c} + \Delta U_{c \to a}$

solve for THIS ↗

(B) $\Delta U_{c \to a} = \frac{3}{2} nR(T_c - T_a)$

$= 0$

WHAT IF? (COULD be on FINAL)

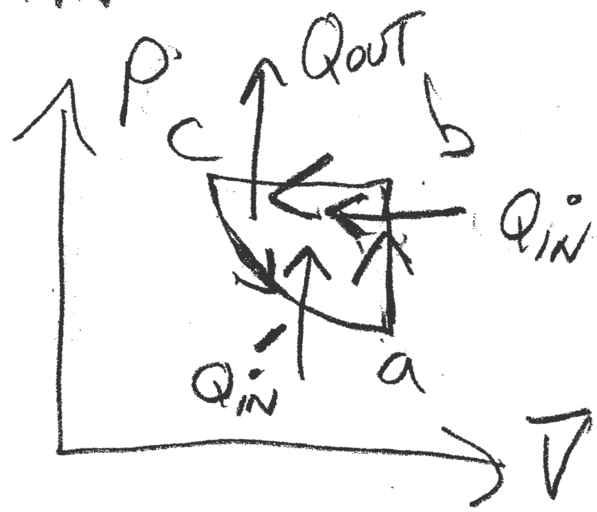
What is efficiency of the engine ASSOCIATED with cycle: $e = \frac{W_{cycle}}{\Delta Q_{IN}}$

(CH16)

$$W_{cycle} = \Delta Q_{cycle} = \Delta Q_{a\to b} + \Delta Q_{b\to c} + \Delta Q_{c\to a}$$

$$e = \frac{\Delta Q_{cycle}}{\Delta Q_{IN}}$$

$$\Delta Q_{IN} > 0$$



$$\Delta Q_{b\to c} < 0$$

$$\Delta Q_{IN} = Q_{IN}' + Q_{IN}$$

$$= \Delta Q_{c\to a} + \Delta Q_{a\to b}$$

$$e = \frac{\Delta Q_{a\to b} + \Delta Q_{b\to c} + \Delta Q_{c\to a}}{\Delta Q_{c\to a} + \Delta Q_{a\to b}} <$$

Engines (CH 16)

WHAT IF #5, S. FINAL continued.

compare efficiency with efficiency of a CARNOT Engine operating betweet hot and cold temperatures:

$$e_C = 1 - \frac{T_{COLD}}{T_{HOT}}$$

$$= 1 - \frac{T_c}{T_b}$$

$\rightarrow T_c = T_a$

SHOW $\varepsilon_C > \varepsilon$ (WHAT IF?)

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6 S Final

MAP → ENTROPY #26, 27, 31, 29, 30.

(a) $\Delta S = \frac{\Delta Q}{T}$ (ISOTHERMAL)

$\Delta T = 0$

$\to \Delta U = 0$

$U \propto T$

$T = 25 + 273\,K$

$= 298\,K$

1ST LAW:

$\Delta Q = \Delta U + W$

$\Delta U \to 0$

PART (b)

$\Delta Q = W = nRT \ln \frac{V_f}{V_i}$

$= 1825\,J$

$\Delta S = \frac{1825\,J}{298\,K}$ FASTEST ANSWER

(14)

(b)

$n = ?$

$$\Delta S = \frac{\Delta Q}{T} = \frac{W}{T}$$

since $\Delta Q = W$.

$$\Delta S = \frac{1825 J}{298 K} = \frac{nRT \ln \frac{V_f}{V_i}}{298 K}$$

note: $T = 298 K$

$$\frac{1825}{298} \frac{J}{K} = nR \ln 2, \text{ since } \frac{V_f}{V_i} = 2$$

solve for n:

$$R = 8.31 \frac{J}{mol \cdot K}$$

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Roundup summary:

FINAL CH 11–16

+ CH 10 simple beam problem.

LINKS: { 12–09, 12–11, 12–13 }

sample test 4, FINAL.

sample T4 (#4) → CH 11 sec. 11.2, 11.3

MAP

(#26, 30, 35, 37)

S.Tes.4
4

16

(a.)

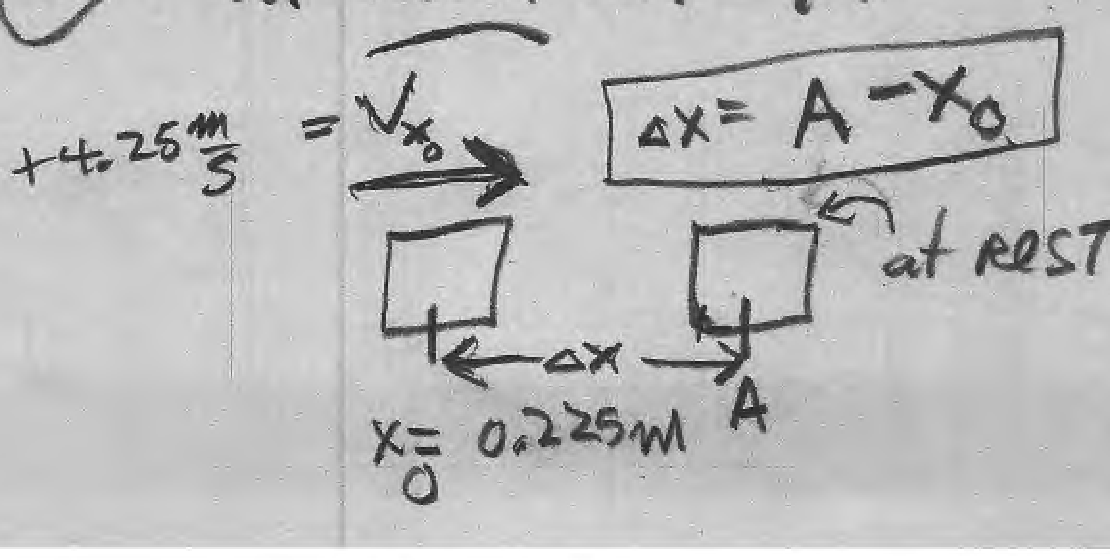
$$\frac{1}{2}mV_{x_0}^2 + \frac{1}{2}kX_0^2 = \frac{1}{2}kA^2$$

$$V_{x_0} = 4.25 \frac{m}{s} \rightarrow$$

$$X_0 = 0.225 (m)$$

plug in, get A.

(b) at rest at $X = \pm A$.



(c) Lab on S.H.M

$$T_{ex} = 2\pi\sqrt{\frac{m}{K}}$$

(d)

$$2\pi\sqrt{\frac{2m}{K}} \Rightarrow \text{double } m$$

$$\Rightarrow T_{new} \to (\sqrt{2})\cdot T_{OLD}$$

(e) $0 < x_0 = A\cos\phi$, ϕ = THETA ($\cos\phi > 0$)

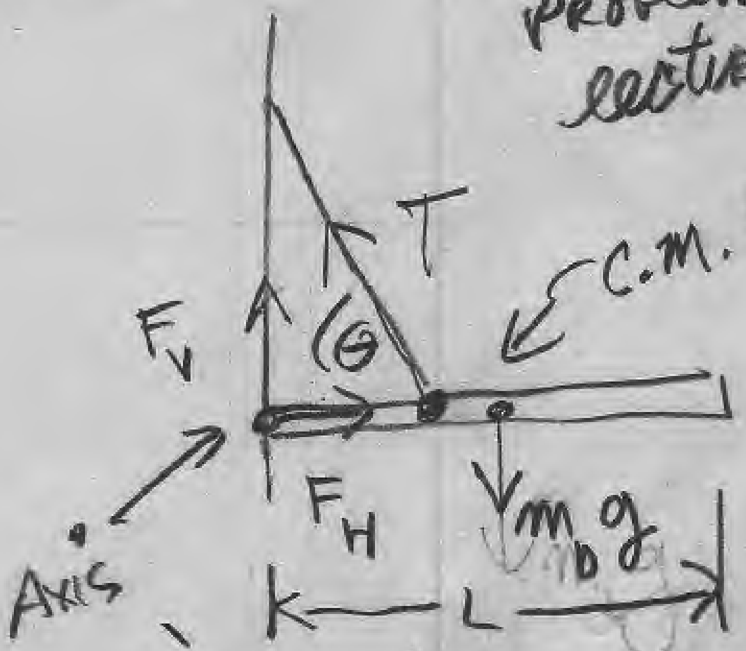
$0 < v_{x_0} = -wA\sin\phi \Rightarrow \sin\phi < 0$ — CHOOSE – ROOT.

$\Rightarrow \phi$ IN QUADRANT 4: $\phi = \pm\cos^{-1}\frac{x_0}{A} = -\cos^{-1}\frac{x_0}{A}$

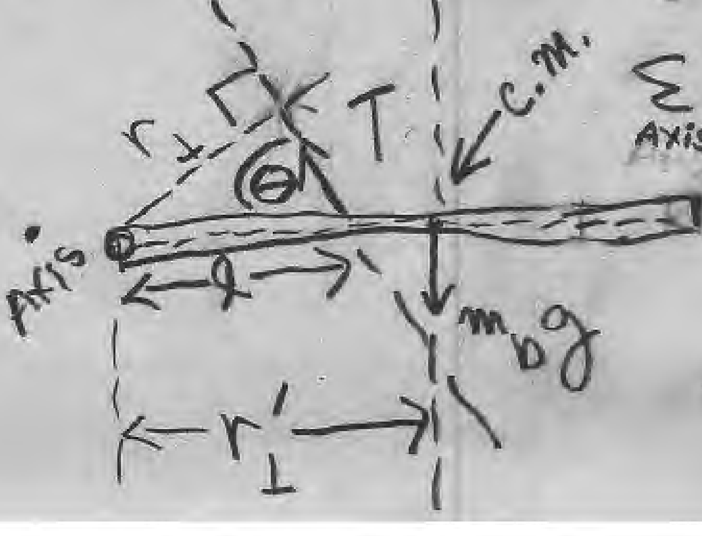
CH10 beam problems

sample test 4 #3 → map CH11 (I will send links of STATIC beam problem lectures)

any static beam problem.



(STATICS)



$$\sum_{Axis} \tau = ↺ - ↻$$

FIND: l given T.

$$0 = r_\perp T - r'_\perp m g$$

$$r_\perp = l \sin\theta; \quad r'_\perp = \frac{L}{2}$$

CH12 FINAL EXAM COVERAGE

#10 ← E.C.

#16 ← standing wave

#33 ← important interference

#39 ← intensity

#40

#52 ← Doppler

#53

↑ see hints at www.mvaphysics.com

BRING SCANTRON; Exam: 5 sheets (10 sides)

COVERAGE CH 10, 11, 12, 13, 14, 15, 16 + T1, T2 and T3