P2/TZ1/SP1 Attempt (unofficial)

1

a (i)

$v = \frac{s}{t}$ $\quad t = \frac{s}{v} = \frac{20x10^3}{7.0} = 2.9x10^3\ s$

(ii)

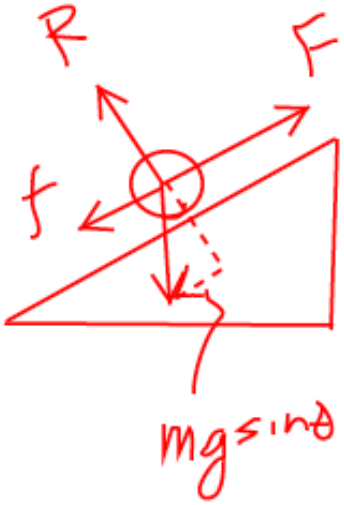
$P = \frac{W}{t} = \frac{qV}{t} = \frac{43x10^3x16}{2.9x10^3} = 237\ W$

237 W

(iii)

P = fv

$f = \frac{p}{v} = \frac{240}{7.0} = 34\ N$



b (i)

$W_X = Wsin\theta = mgsin\theta = 66x9.81xsin3.0 = 34\ N$

(ii)

F = f + $W_X = 34 + 34 = 68\ N$

$P = Fv. \quad v = \frac{p}{F} = \frac{240}{68} = 3.5\ ms^{-1}$

(c)

component of weight down the slope has increased or increased mass means more work required

(d)

$r = \frac{\varepsilon - V}{I} = \frac{16 - 12}{6.5} = 0.62\Omega$

e(i)

3.2 V

(ii)

$r_{total} = 0.62\Omega$

$r_{parallel} = \frac{0.62}{5.0} = 0.124\Omega$

$0.124 = (\frac{1}{r} + \frac{1}{r})^{-1}$

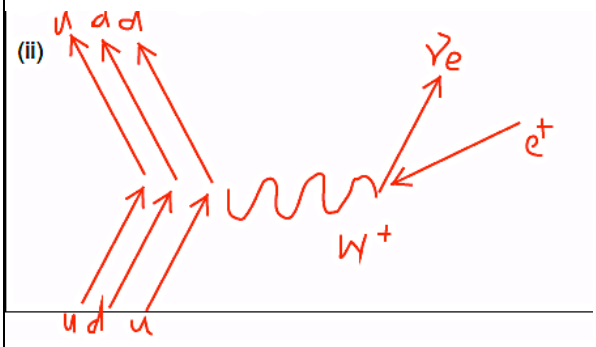
r = 0.248Ω

2

a (i)

$^{30}_{15}P \longrightarrow {}^{30}_{14}Si + {}^{0}_{+1}e + \upsilon_e$

(ii)



	(iii) (color) confimenent is a phenomeon that charged particles cannot be isolated singularly The energy added (to the gluon field) converts to mass and produces new quarks/hadrons. (b) new information/technology may change models
3	(a) each slit acts as a source of spherical waves which interfere as they move away from left to right path differences equal to n (integer or whole number) times one wavelength, the wave interfere constructively and has phase difference with 0 degree (b) path difference = 1.243 – 1.181 = 0.062 = nλ= 2λ $\lambda = 0.031\ m$ $f = \frac{c}{\lambda} = \frac{3.0x10^8}{0.031} = 9.7\ x\ 10^9\ \ Hz$ (c) Light interferes constructively at well-defined angles, resulting in varying (integer) path differences; intensity is inversely proportional to the square of distance (path difference). Light has farther to travel at the Y than at W due to path difference, hence intensity at W is greater. OR power is directly propostial to amplitude squared. As the power per square meter decreases with distance, thus the amplitude across a single square meter also decreases with distance
4	(a) $P_c = \frac{F}{A} = \frac{mg}{A} = \frac{\rho Vg}{A} = \frac{\rho Ahg}{A} = \rho gh$ b(i) $(P_m + P_0)V = nRT$ $(P_m + P_0)Ah = nRT$ $(P_m + P_0)x0.190 = nRT/A$ (ii) upside down: $P_m + P_g = P_0 \qquad P_g = P_0 - P_m$ $(P_m + P_0)V_1 = (P_0 - P_m)V_2$ $(P_m + P_0)Ah_1 = (P_0 - P_m)Ah_2$ $P_0 = \frac{h_1 + h_2}{h_2 - h_1}P_m = \frac{h_1 + h_2}{h_2 - h_1}\rho gh_m = \frac{0.208 + 0.190}{0.208 - 0.190}x\ 1.36x10^4x9.81x0.035 = \ 1.03\ x\ 10^5\ \ Pa$ (iii) length of the gas column increases and internal surface area increases, gas molecules travel longer distance and requency of collions decrease on the wall of the mercury. Or temperature is constant, and the molecules must strike less often for the pressure to decrease

	if average speed (squared) remains the same.
5	(a) $V = \frac{m}{m+m}u = \frac{1}{2}x0.8 = 0.4\ ms^{-1}$ (b) $E_f = \frac{1}{2}(m+m)V^2 = \frac{1}{2}(2m)V^2 = 0.075x0.4^2 = 0.012\ J$ $E_i = \frac{1}{2}(m)u^2 = \frac{1}{2}x0.075x0.8^2 = 0.024\ J$ $E_f\ not\ equal\ E_i\ (energy\ not\ conserved)$, inelastic (c) GPE max at exatrem points and GPE minimum when lowest (central) position
6	a (i) $I = \frac{P}{A} = \frac{\sigma AT^4}{A} = \sigma T^4$ 1.36X$10^3 = 5.67x10^{-8}\ T^4$ T = 394 K (ii) sun light falls almost vertically at A. But as latitude increases and so same light is spread on larger area, $I = \frac{P}{A}$, A increases, intensity decreases, hence temperature decreases b 28% power reflected by Earth's atmosphere or 78% energy absorbed by the blackbody → energy balance occurs at a lower temperature. (c) (i) Gravitational force between Earth and moon provides the centripetal force (ii) Work done is force times the distance in the direction of force. In this case, force and displacement is perpendicular, W = Fdcosθ, $\theta = 90^o, W = 0$