**PHYSICS PAPER 1 FORM 4**

**MARKING SCHEME**

1. **a)Negative error = 0.06 (-0.06cm)**

   **b) Reading = 2.15 + 0.06 = 2.21 cm**

2. **Total mass = m1 + m2**

   **M1 = 0.8x x** **m2= 1 x 100**

   **= 0.8xg** **= 100g**

   **Total = (0.8x + 100)g**

   **Total volume = (x + 100)** $\sqrt{1}$

   **Density of mixture** $= \frac{0.8x + 100}{x + 100} = 0.96\ \sqrt{1}$

   $x = \frac{4}{0.16} = 25\ cm^3\ \sqrt{1}$

3. **Due to constant bombardment of chalk and air particles.**

4. **a) Work done = F x d = Initial K.E.**

   $\frac{1}{2} \times \frac{10}{1000} \times (400)^2 = F \times \frac{4}{100}$

   **F = 20000 N** $\sqrt{1}$

   **b) K.E. changes to heat and sound.**

5. **- Lower the temperature**

   **- Remove impurities**

6. **Energy can neither be created nor destroyed but can be Converted/transformed from one form to another.**

7. **Gas Pressure = Atmospheric Pressure – Pressure due to $H_g$ Volumn**

   $$P_g = 1.0x10^5 - 0.4 \times 13600x10$$
   $$= 94560N/m^2$$

8. $P_1V_1 = P_2V_2$

   $26 \times (a + 5) = 30(a - 5)$

   $26a + 130 = 30a - 150$

   $4a = 280$

   $a = 70cmHg$

**9. a)-Sum of clockwise moments must be equal to sum of anticlockwise moments about the same point**

**-Sum of upward forces must be equal to sum of downward forces**

**b) sum of clockwise moents = sum of anticlockwise moents**

$x(0.3) + 2.0 \times 0.1 = (30 \times 0.2) + 2 \times 0.1$

$0.3x = 6.2 - 2.0$

$x = 14N$

**10. To increase surface area of contact thus reducing pressure exerted on the road**

**11. (i) Archimedes Principle states that when a body is partially or completely immersed in a fluid it experiences an upthrust which is equal to weight of the fluid displaced.**

**(ii) Volume of solid in liquid A = 1cm x $2cm^2$ = $2cm^3$**

**= 2 x $10^{-6}m^3$**

**Mass = volume x density**

**= 2 x $10^{-6}$ x 8000**

**= 2 x $10^{-3}$ x 8**

**= 16 x $10^{-3}$kg**

**= 1.6 x $10^{-2}$kg**

**W = Mg = 1.6 x $10^{-1}$ = 0.16N**

**Volume of the block in liquid B = 1.5cm x $2cm^2$ = $3.0cm^3$**

**= 3 x $10^{-6}m^3$**

**M = ρ x V**

**= 12000 x 3 x $10^{-6}$**

**= 12 x 3 x $10^{-3}$**

**= 36 x $10^{-3}$**

**= 0.036kg**

**W = Mg = 0.036 x 10 = 0.36N**

**(iii) Mass of the block =**

**Upthrust = 0.36 + 0.16**

**= 0.52N = Weight of the block**

**W = Mg**

**0.52 = M x 10**

**M = 0.052kg = 52g**

**(iv) Density of the block** $= \frac{Mass}{Volume} = \frac{52}{2 \times 4}$

$$= \frac{52}{8} = 6.5g/cm^3$$

**12. (i) collision where only linear Momentum is conserved and bodies moves together after collision (coelesce).**

**(ii) I Momentum before collision = Momentum after collision**

$$(1600 \times 20) + (800 \times 0) = (1600 + 800)V$$

$$V = \frac{32000}{2400} = 13.33m/s$$

**II** $V = U + at$

$\Rightarrow 13.33 + 15a \Rightarrow$ **pa** $= -0.89m/s^2$

$V^2 = U^2 + 2as \Rightarrow S = \frac{V^2 - U^2}{2a} = \frac{0 - (13.33)^2}{-2(0.89)}$

$= 99.83m$

**III** Impulse tone $= \frac{\Delta P}{T} = \frac{1600(20 - 13.33)}{2}$ **for minibus**

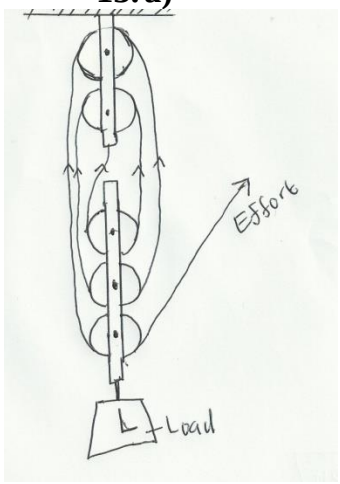
$= 5336N$

**Or**

**Or** $\frac{800(13.33 - 0)}{2}$ **for a car**

$= 5336N$

**13. a)**




**b) V.R =Number of the ropes supporting the load = 6/1**

**c)** $V.R = \dfrac{1}{Sin\ 30} \dfrac{1}{½} = 2$

**M.A = E x V.R**

$= \dfrac{80}{100} \times 2 = 1.6$

$E = \dfrac{L}{M.A} = \dfrac{50 \times 10}{1.6} = 312.5N$

**Work done against friction = Work input – Work output**

**Mgh**

**Work output = 50 x 10 x 4**

**= 2000J**

**Work input = Effort x distance moved by effort**

$= 312.5 \times \dfrac{4}{Sin\ 30}$

**= 2500J**

**Work done against friction = 2500 – 2000**

**= 500J**

**d) Work = total area under the graph**

**= (4000 x 20) + 6000 x 20) + (½ x 6000 x 10) + (½ x 600 x 20)**

**= 80000 + 120000 + 30000 + 60000**

**= 290,000J**

**14. a) The direction is continuously changing.This implies change in velocity hence acceleration.**

**(b) (i)** $\omega = 2\pi f = 2 \times 3.142 \times 6 = 37.704 rad/s$

**(ii)** $a = \dfrac{v^2}{r} = r\omega^2 = 37.704 \times 37.704 \times 0.6 = 852.955 m/s^2$

**(iii)** $T = F_c = mr\omega^2 = 0.045 \times 0.6 \times 37.704 \times 37.704 = 38.38N$

**(iv)** $V = r\omega = 0.6 \times 37.704 = 22.62 m/s$

**(c)(i)**

$\frac{50-0}{2.5-0} = 20.0N/Kg$ ✓1

**(ii)**

$\frac{p}{m} = slope$

$p = m \times slope = 20 \times 0.2$ ✓1 $= 4.0N$

**(iii It represents centripetal force**

**15. a) Specific heat capacity is the quantity of heat required to raise the temp. of a unit mass of a substance by one Kelvin.**

**b) i)Heat gained by calorimeter = $M_C C_C \Delta\theta$**

**= Heat capacity x $\Delta\theta$**

**= 40 x (34 – 25)**

**= 40 x 9 = 360J**

**Heat gained by water = $M_W$ x $C_W$ x $\Delta\theta$**

**= 0.10 x 4200 x 9**

**= 3780J**

**(ii) Heat lost by metal block = 3780 + 360 = 4140J**

**(iv) Heat lost by metal block = Heat gained by calorimeter + water**

**$M_b$ x $C_b$ x $\Delta\theta$ = 4140**

**0.15 x $C_b$ x (100 – 34) = 4140**

**(66 x 0.15)$C_b$ = 4140**

$$C_b = \frac{4140}{66 \times 0.15} = 418.18 Jkg^{-1}k^{-1}$$

**c) I)Q = ML + McΔθ✓1**

$$= \frac{200}{1000} \times 3.36 \times 10^5 + \frac{200}{1000} \times 4200 \times (X - 0)$$

$$= 6.72 \times 10^4 + 420X$$

$$67200 + 420x$$

**ii) Heat lost = heat gained**

**67200 + 420x = 67840 – 1696x**

**(420 + 1696)x = 67840 – 67200**

**2116x = 640**

**x = 0.293°C**