Sept. 18. Pp. 1.

1. a i. t. mass = 1.421×10^6 kg. $\omega = mg = 1.421 \times 10^6 \times 10$

$\uparrow F = 2.28 \times 10^7$ N $\omega = 1.421 \times 10^7$ N

ii. $\uparrow 2.28 \times 10^7$ N $RF = (2.28 \times 10^7) - (1.421 \times 10^7)$

$\downarrow 1.421 \times 10^7$ N $RF = 8,590,000$ N

iii. $F = ma$ $a = \frac{8590000}{1.421 \times 10^6} = 6\ m/s^2$

$8590,000 = (1.421 \times 10^6)\,a$

b. Newton's 2nd law, F = ma

c. 8,590,000 N

d. For every action, there is an equal + opposite reaction.

e. $29,000\ km/hr = \frac{29000\ km}{1hr} = \frac{29000 \times 1000}{1 \times 60 \times 60} = 8056\ m/s$

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2 a. momentum is the product of mass and velocity. The motion of a moving object.

b. A has a larger probability of knocking cardboard down since it has a greater mass, ∴ greater momentum.

c. $PE = mgh = 1.6 \times 10 \times 0.8 = 12.8\ J$

(d) PE lost = KE gained

$12.8 = \frac{1}{2}(1.60)v^2$

$\frac{25.6}{1.6} = v^2$

$v = \sqrt{16} = 4 m/s$

(e) momentum = mV

= 1.6 × 4

= 6.4 kg m/s

(f) mom bef = mom aft

$6.4 + 0 = (1.6 + 0.5)V$

$\frac{6.4}{2.1} = V = 3.05 m/s$

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3 a. particles move at right angles to the direction of travel

b. all obey v = fλ, all can be refracted, reflected + diffracted. all travel in a vacuum.

(c) γ rays (d) chemotherapy (e) UV.

f. $v = f\lambda$

$3\times10^{14} \times \lambda = 3\times10^{8}$

$\lambda = \frac{3\times10^{8}}{3\times10^{14}} = 1\times10^{-6} m$

1 wave = 1×10^{-6} m

? = 3.5 m

$\frac{3.5}{1\times10^{-6}} = 3,500,000$ waves

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4 a. particles, parallel, direction, compressions, rarefactions, wave

b. 20,000 Hz (ci) ultrasound, not heard by humans

c ii $f = \frac{1}{T}$, $T = \frac{1}{100,000} = 1\times10^{-5}$ s aii speed = $\frac{dist}{t}$

330 = $\frac{dist}{0.0091}$

dist = 330 × 0.0091

dist = 3.003 m

5a $V = IR$

$12 = 0.11 \times R$

$R = 109\Omega$

Similarly $V = IR$

$12 = 0.3 \times R$

$R = 12/0.3 = 40\Omega$

b on graph paper

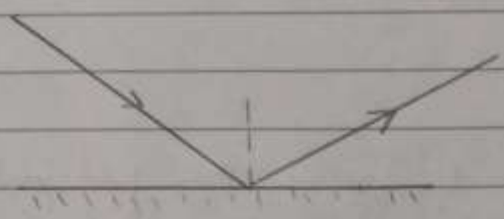
(c) 70°C.

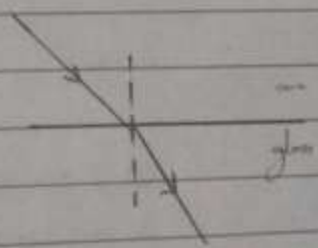
d. No loose + rusted connections

(e) very large

f. temp $\frac{1}{\alpha}$ resistance

6a





b.i (freq remain constant) λ changes

(ci) on graph paper

ii $n = \frac{\text{Real depth}}{\text{app. depth}}$

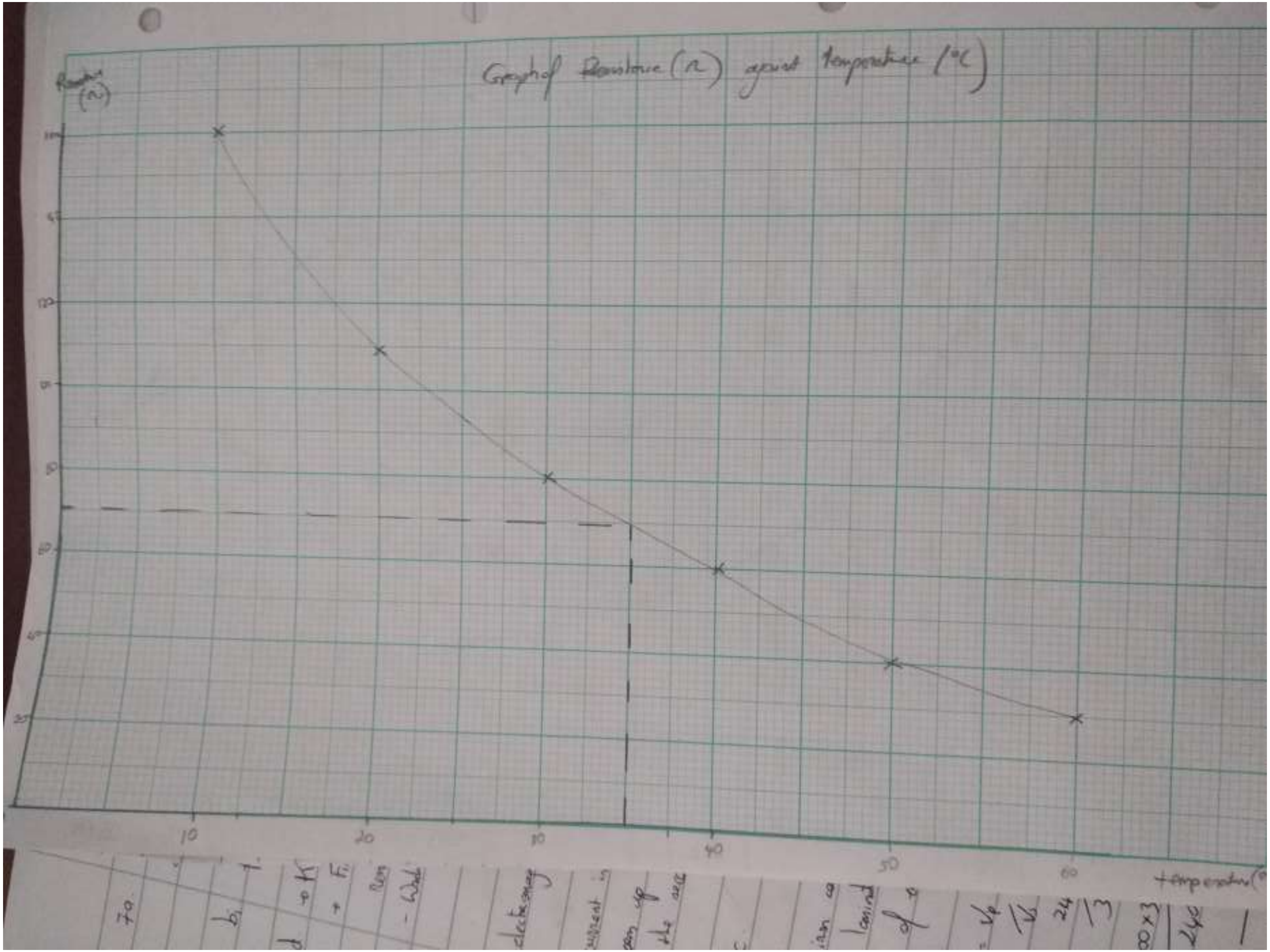
$1.33 = \frac{\text{real depth}}{0.8}$

real depth = 0.8 × 1.33 = 1.064m

(cii) mag = $\frac{h_i}{ho} = \frac{d_i}{do}$

$= \frac{6}{3}$

$= 2$.


Graph of Resistance (Ω) against temperature (°C)
Resistance (Ω)
10
20
30
40
50
60
temperature

7a. the time taken for the atoms of a radioactive substance to decay by ½.

b i. β (bii) alpha. (c) 200 → 100 → 50 → 25 3h.1. ∴ 42.6 ÷ 3 = 14.2 minutes

d. • Know the half life for carbon 14
• Find how much of carbon 14 are remaining in tree
- Work backwards to find the age

(e) to preserve food.

8.a. electromagnetic induction

b. current in primary coil forms an electromagnet + field around coil open up + cuts solenoid in secondary coil, inducing a current in the secondary coil.

c. a.c.

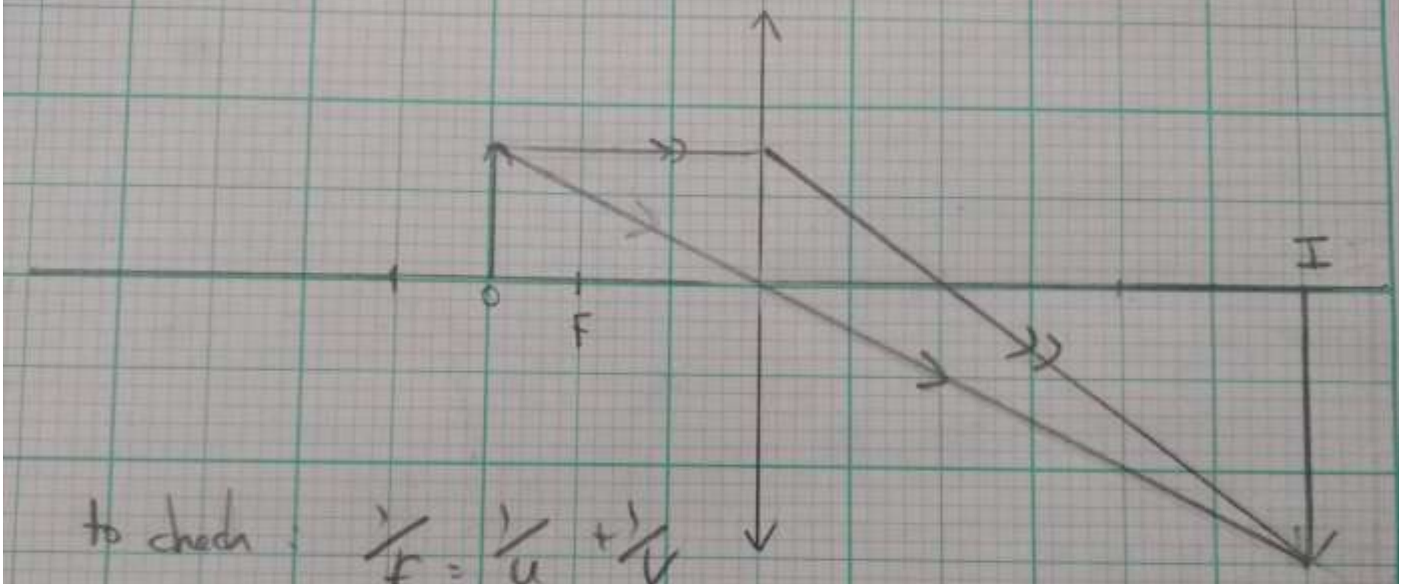
d. the iron core is there to have a stronger field produced + it is laminated so that eddy current are reduced to have efficient transfer of energy

e.
$$\frac{N_p}{N_s} = \frac{V_p}{V_s}$$

$$\frac{4000}{N_s} = \frac{240}{3}$$

$$N_s = \frac{4000 \times 3}{240} = 50 \text{ turns}$$

(f) some energy is always lost such as from eddy currents



to check:

$$\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$$

$$\frac{1}{2} = \frac{1}{3} + \frac{1}{v}$$

$$\frac{1}{v} = \frac{1}{2} - \frac{1}{3} = 5.99 \approx 6$$

9a Hooke's law

b. For an elastic material, force applied is directly ∝ to the extension provided that elastic limit was not exceeded.

c. $W = mg = (100 \div 1000) \times 10 = 1N$

d. F → ext
1N → 16 − 10 = 6cm

$F = ke$
$1 = k(0.06)$
$k = 16.7 N/m$

e. $F = ke$
$(0.15 \times 10) = 16.7(e)$
$e = \frac{150}{16.7} = 0.0899$

∴ new length = 0.1 + 0.09
= 0.19 m

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10. a. as particles heat up, they gain KE and expand.

b. Since object expands, V↑, ∴ since $\rho \overset{1}{\alpha} V$, then V↑, ρ↓.

c. When the water falls on hot object, the water heats up, reaching boiling point + hence change into steam − evaporate.
the remaining particles on wheel are left with less KE, ∴ cool down

d. $\rho = \frac{m}{V} = \frac{500}{64} = 7.81 g/cm^3$

e. their ρ is greater than ρ of water, ∴ sink