May 15 Pp.2A

1a. m = 150g = 0.15 kg
E = 5 J.

Work done is energy that the spring is using, in this case that is stored in the spring. It can be found by multiplying the Force and distance.

b. elastic potential energy in spring } is converted to { kinetic energy in the car

there will be some energy being changed to heat + sound losses.

c. KE = ½ mv²

5 = ½ (0.15) v²

(5 × 2) / 0.150 = v²

v = ~~0.26~~ 8.16 m/s

d. Assumed that all energy was converted to useful energy + that there were no energy losses.

? e. Since there was an external force on the car, then it will

f. A spring with a different spring constant should be used. It needs to be compressed much more, so that the stored energy would be greater, so the speed would also be higher.

g. momentum = m × v = 0.150 × ~~0.26~~ 8.16 = ~~39~~ 1.22 kg m/s.

h.

bf		after
m_1	m_2	m_1+m_2
m = 0.15 kg.	m = 0.1 kg.	0.25 kg.
v = 8.16 m/s	v = -2 m/s	V.

mom. bf = mom. after

$(0.15 \times 8.16) + (-2 \times 0.1) = 0.25V$

$1.224 + (-0.2) = 0.25V$

$1.024 = 0.25V$

$V = \frac{1.024}{0.25} = 4.1$ m/s.

i., j. By Newton's 3rd Law, for every action there is an equal + opposite reaction. ∴ the wall exerts a 2 N force on the cars.

k. $Ft = mv - mu$ (−2 N since opp. to their motion)

$-2t = 0 - (0.25 \times 4.1)$

$-2t = -1.025$

$t = \frac{-1.025}{-2} = 0.5125$ sec.

l. if the wall collapses, the time of collision may become longer. ∴ t↑, F↓, since the force of impact is inversely ∝ to the time of collision.

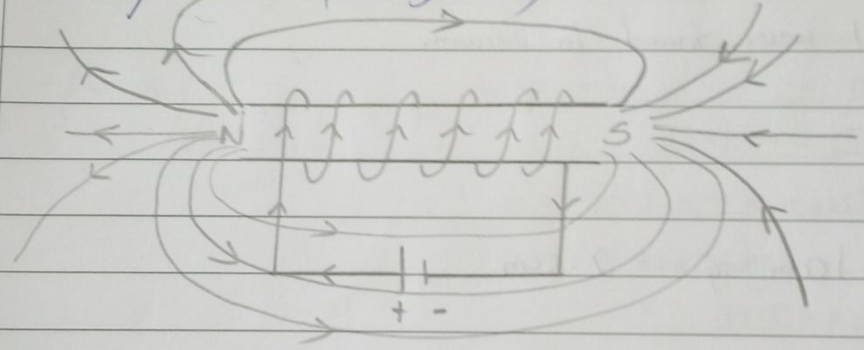
2a i. Since moving in direction of A is cutting the magnetic flux, then there would be a current induced in the wire & the ammeter would give a reading.

ii. Since moving sideways, parallel to the ~~lines of magnetic flux~~ magnetic field lines, there will be no current induced in wire so ammeter reads 0

iii. Since motion is faster & in direction A, the ammeter gives a bigger reading since a bigger current is induced.

?? iv. Fleming's R.H. Rule (or Lenz's Law)

b. i, ii



iii. increasing the no. of turns or introducing an iron core. increasing the power supply

iv. In scrap yards, so when no iron parts need to be collected, the electromagnet is switched off.
Also it would be easy to drop the iron parts attracted at the required location - by simply switching off the current passing through electromagnet.

v. the direction of the magnetic field would start alternating since with a.c. the direction of the current is continuously changing.

3ai. P: longitudinal Q: transverse

ii energy is transferred from one side to another.

iii. a) P b) Q.

b. i. 1) the hammer is seen vibrating, ∴ light waves travel in vacuum
2) the sound of bell is never heard, ∴ sound waves do not travel in a vacuum.

ii). Sound waves do not travel in vacuum
Light waves travel in vacuum.

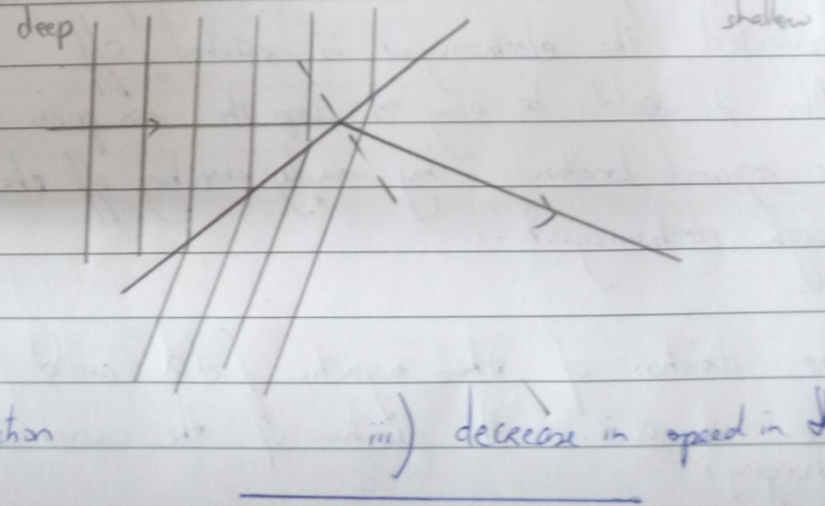
iii)

c. i $\lambda = 10cm \div 4 = 2.5cm$

ii. 40 vib in 8s. $1 \times 40 / 8 = 5Hz$
? = 1s

iii $V = f\lambda = 5 \times 0.025m = 0.125 m/s.$

di)



ii.) Refraction iii) decrease in speed in the shallow

3a i. P: longitudinal Q: transverse.

ii. energy is transferred from one side to another.

iii. a) P b) Q.

b. i. 1) the hammer is seen vibrating, ∴ light waves travel in vacuum
2) the sound of bell is never heard, ∴ sound waves do not travel in a vacuum.

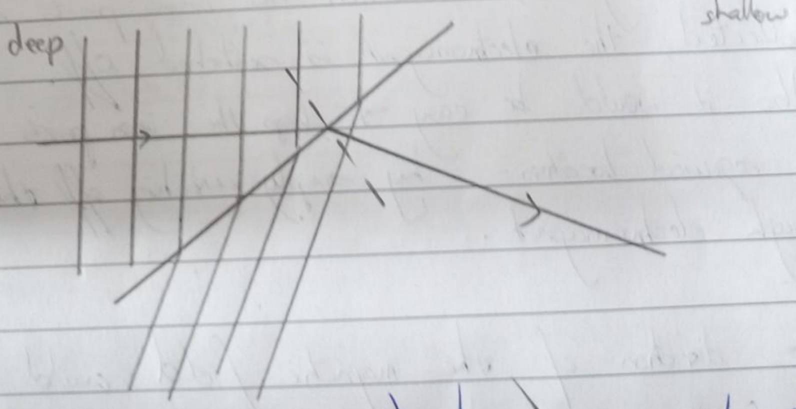
ii). Sound waves do not travel in vacuum
Light waves travel in vacuum

?? iii)

c. i $\lambda = 10cm \div 4 = 2.5cm$

ii. 40 vib in 8s. $1 \times 40 / 8 = 5Hz$
? = 1s

iii $v = f\lambda = 5 \times 0.025m = 0.125 m/s$.

di) 

ii.) Refraction iii) decrease in speed in the shallow water.

4. $h = 64m$

$\rho_{sea} = 1050\,kg/m^3$

Atm. $P = 100,000Pa$

ai) $P_{wat} = h\rho g = 64 \times 1050 \times 10$
$= 672,000\ Pa$

aii) $T.P. = 672000 + 100000 = 772000Pa$

iii) P on X is greater than that on Y since X is at a greater depth. but P on Z is greater than that on X since Z is even at a greater depth.

Y
X
Z

b i) $d = 0.85m$, $Rad = 0.85 \div 2 = 0.425m$

$\rho = m/V$

$1050 = \frac{m}{\pi R^2 h} = \frac{m}{\pi \times 0.425^2 \times 64}$

$m = 1050 \times \pi \times 0.425^2 \times 64$

$m = 38,133\ kg$

$\therefore F = 38133 \times 10 = 381330\ N$

OR

$P = F/A$

$672,000 = \frac{F}{\pi(0.425)^2}$

$F = 381330\ N$

bii) Since more force is needed to overcome fluid resistance

??

Ci. → sound waves of a frequency higher than the audible frequency.

→ they can be reflected

ii. these waves are produced by the vibrators being parallel to the direction of travel of the wave, creating compressions + rarefactions in the water particles, in the form of longitudinal waves.

d i. the speed of sound in seawater.

ii. speed = s/t but time needs to be divided by two (time t is the time taken to move to obstacle + to come back).

iii. sterilising of medical equipment or to clean cosmetic equipment on teeth.

iv. this may be because something is in between the submarine + the seabed.

---

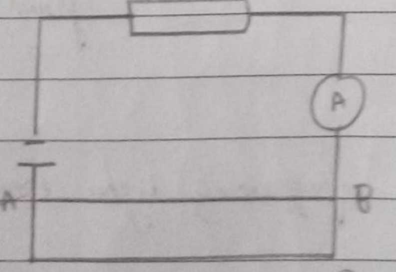
5. a. $V = IR$ $R = 2/0.4 = 5\,\Omega$

$2 = 0.4R$

$R_T = 5 = 2 + R_{AB}$

$R_{AB} = 5 - 2 = 3\,\Omega$

b i



ii) R in parallel ⇒

$1/R_T = 1/3 + 1/3 = 2/3$

$R_T = 1.5\,\Omega$

$\therefore TR = 1.5 + 2 = 3.5\,\Omega$

c i. ½ length → ½ resistance since length of wire ∝ resistance c ii. different metal, if it is a better conductor, Resistance decreases.

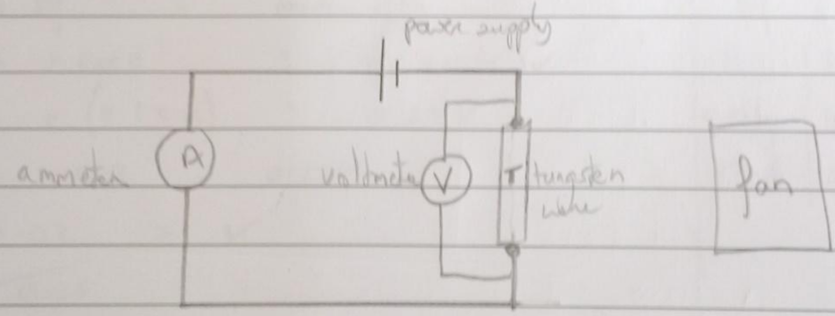
c iii. larger diameter, ↑ area, ↓ Resistance since area of wire is 1/∝ to Resistance.

d i. ↑ R, ↑ temp. ∴ temp. + Resistance are directly ∝.

ii. Wind speed ↑, ↓ temp ∴ ↓ Resistance.
∴ wind speed is 1/∝ Resistance.

iii. voltmeter + ammeter so that resistance can be calculated

iv.



v. - Set up apparatus as shown on the diagram and place fan in front of wire.
- Set fan setting on the lowest speed, take note of the voltage across the tungsten wire + the current in the circuit.
- Use R = V/I to find the Resistance + note all values in a table.
- Repeat procedure for the other 2 settings of the speed of the fan.
