

Physics May 2013

Paper IIA

- 1 ai) electric current is the rate of flow of electrons
- 1 aii) ammeter
- 1 aiii) in series
- 1 bi) $R_t = 200\Omega$
- 1 bii) $I = 0.015A$
- 1 biii) $V = 0.75V$
- 1 biv) $V = 2.25V$
- 1 ci) $R_t = 16.67\Omega$
- 1 cii) The current in the parallel branches is not the same since the total current in the circuit is divided between the branches.
- 1 di) The purpose of the fuse is to protect the electrical appliance from excessive currents, when a fault occurs. IT melts so that it creates an open circuit and stop current from passing through the appliance.
- 1 dii) Max current allowed in circuit is 0.833A. Therefore, 1A fuse is required.
- 2 ai) Hooke's law states that for an elastic material the extension of a spring is directly proportional to the applied force ($e \propto F$), i.e. as long as the elastic limit is not exceeded.
- 2 aii) She needs to add the masses gradually and make sure not to exceed the elastic limit.
- 2 aiii) She removes the load and check that the spring goes back to the original length.
- 2 aiv) $ext = 6cm = 0.06m$, $F = 1N$, $k = 16.7N/m$
- 2 av) Force has both magnitude and direction. Eg. 10N to the right is not as 10N to the left
- 2 bi) Equilibrium means that a system is balances since the sum of clockwise moments is equal to the sum of anticlockwise moments and that the upward forces are equal to the downward forces. (important that you state both)
- 2 bii) Make sure you state that since balances, clockwise moment = anticlockwise moments.
- $d = 0.3m$
- 2 biii) The weight of the ruler is acting at its centre since it is uniform, exactly above the pivot. Therefore it creates no moment since the distance from pivot is 0.
- 2 biv) F2 must be moved closer to the pivot at the same time that F1 must be moved away from it.

2c) when one uses a screw driver, the distance increases and hence a bigger moment is produced

3ai) 10m/s^2

3aii) Since there is no air resistance, there is always a resultant force downwards due to the weight. Therefore, by Newton's 2nd law of motion, the sphere will accelerate downwards and terminal speed is never reached since the sphere will never have downward forces = upwards forces. (these marks were not given to students since terminal velocity is not in syllabus)

3aiii) $t = 3.286\text{s}$

3aiv) $v = 32.86\text{m/s}$ (using one of the equations of motion)

3av) $\text{KE} = 10,798\text{J}$

3bi) Since there is no air resistance, the time of fall will be the same since the objects will experience the same acceleration since they never reach terminal velocity.

3bii) $a = 0.27\text{m/s}^2$

3biii) $v = 5.4\text{m/s}$

3biv) $F = ma = 16.2\text{N}$

3bv) Resultant force = downward force - upward force

$$600 - 16.2 = 583.8\text{N}$$

4ai) Red, Orange, Yellow, Green, Blue, Indigo, Violet

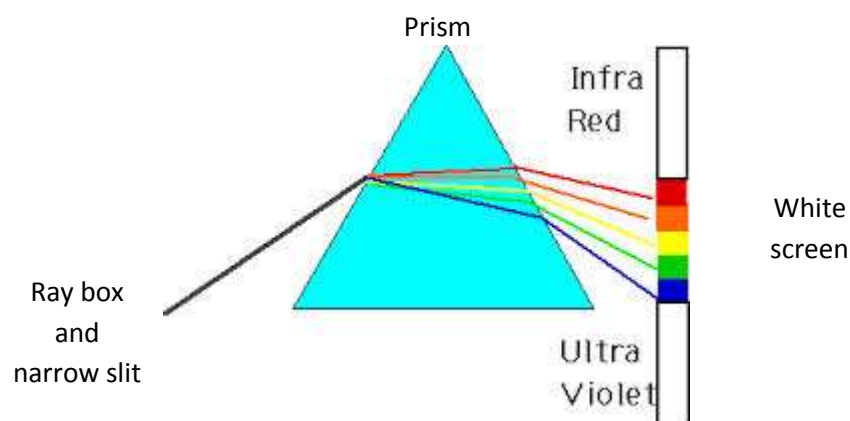
4aii) velocity of light is higher than the velocity of sound

4aiii) Red (can be reasoned from the electromagnetic spectrum)

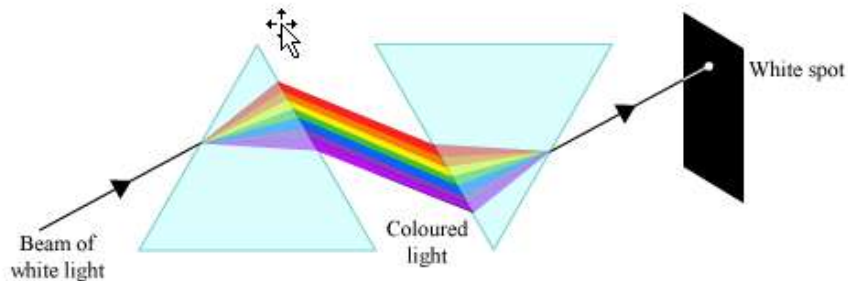
4aiv) Violet

4bi) Set up the apparatus as shown. Turn on the ray box and point it towards the prism. When white light enters the prism, light disperses into the 7 colours and these form an image on the white screen. The screen is moved back and forth so that a clear image is formed.

4bii)



- 4biii) The convex lens is producing parallel rays and a clear image of the colours.
- 4biv) refraction and dispersion
- 4c) He must use another prism, place it after the other prism before the white screen but he must place it upside down (inverted).



Another way of combining white light is by place the lens between the screen and the prism, and you move it back and forth until a white light shows. [See explanation](#)

- 5ai) The a c voltmeter
- 5aii) the wind rotates the plastic cups which made the magnet turn, cutting magnetic field lines (lines of flux) and inducing a voltage in the coil which is measured by the a.c. voltmeter.
- 5aiii) when speed of air increases, the reading on the voltmeter increases since a greater induced current results and therefore a greater voltage is generated
- 5aiv) no of cups, Voltage
- 5av) increasing the number of turns and using a better core
- 5bi) By mutual induction. When the ac supply is switched on, the current that passes through the transmitting coil generates an alternating magnetic field around the coil, which induces a magnetic field in the receiving coil (due to the cutting of magnetic field lines) . Hence transferring power to the mobile phone.
- 5bii) So that the alternating current generates alternating cutting of magnetic field lines and therefore there is a continuous induced current in the mobile phone
- 5biii) $I = 0.96A$
- 5biv) To avoid excess induced current

(I am not sure about this. I tried looking for good answers but failed to find an answer)