

Physics May 2013

Paper I

- 1a) Mercury, Venus, Earth,
Mars, Jupiter, Saturn,
Uranus, Neptune
- 1b) Gravitational Force
- 1c) A celestial body that does not obey one of the criteria to classify it as a planet]
- 1d) The planet needs to be a celestial body that is in orbit around the sun, has a nearly round shape, has cleared the neighbourhood around its orbit.
- 1e) Telescope
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- 2a) 2.5J
- 2b) 5W
- 2c) 62.5%
- 2d) 1.6J
- 2e) 4m/s
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- 3a) positive
- 3b) by rubbing, the friction caused heat which caused electrons to flow from the cloth to the ruler, leaving excess electrons on ruler (negatively charged) and lack of electrons on cloth (positively charged)
- 3ci) repel
- 3cii) attract
- 3d) like charges repel, unlike charges attract
- 3e) less paint is wasted, the object receives an even coat and the paint covers awkward 'shadow' surfaces that the operator cannot see.
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- 4a) ice cubes have a smaller density than water, therefore they float
- 4bi) thermometer

4bii) 100g

4biii) 16800J

4biv) 3.5mins

5ai) a: increase b: decrease

5aii) Both A and B 25°C

5aiii) after such a long time, both blocks would lose heat to the surroundings until they reached room temperature

5aiv) glass is a worse conductor of heat than metal the process of B heating A would take longer

5bi) Heat flows through A since a good conductor, therefore wax between A and B melts, therefore, B and C fall together

5bii) conduction

6ai) convex

6aii) mark arrows, mark F 6 boxes away from the lens (towards the right, where ray meets the principal axis)

6aiii) answers between 0.025m and 0.026m

6aiv) image should be located on the same side of object (6 boxes away from lens on the left), erect and magnified

6av) 2 (answers may vary slightly due some some inaccuracies)

6vi) eyepiece lens of a telescope or a microscope

7a) $\frac{3}{4}$ of page, P on y-axis and h on x-axis, title, labellings

7bi) P is directly proportional to h. They ALSO expected you to say that density and gravity were kept constant

7bii) 10500Pa/m (marks reduced if units are not given)

7biii) 1050kg/m³

8a) 2 wavelengths

8b) 0.02m

- 8c) 0.4m
- 8d) 24m/s
- 8e) 0.0167s
- 8fi) same wavelength, bigger amplitude
- 8fii) smaller wavelength (waves closer together), same amplitude
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- 9ai) 137 nucleons
- 9aii) ${}^{137}_{56}\text{Ba}$
- 9bi) an electron
- 9bii) ionises weakly, stopped by aluminium
- 9c) An isotope is an atom of the same element with the same proton number but a different mass number
- 9di) gamma rays
- 9dii) alpha rays
- 9e) detecting leakages in pipes that are buried underground or for quality control to make sure that the thickness of a sheet of glass, or paper, or anything else, is constant throughout
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- 10ai) kgm/s
- 10aai) 9.6kgm/s
- 10aaiii) $9.6 + 0 = 9.6\text{kgm/s}$
- 10bi) total momentum before = total momentum after = 9.6kgm/s
- 10bii) 4.8m/s
- 10biii) Law of conservation of momentum; total momentum before = total momentum after
- 10biv) there are no external forces