Examiner only

SECTION B

The questions refer to the Case Study.
Direct quotes from the original passage will not be awarded marks.

7. *(a)* The distance between the Earth and the Moon is 400 000 km. Calculate the time taken for laser light to travel from Texas to the Moon and back (paragraph 5). [2]

(b) Explain why a pit depth of a quarter wavelength in a CD 'maximises the interference' (paragraph 11). [2]

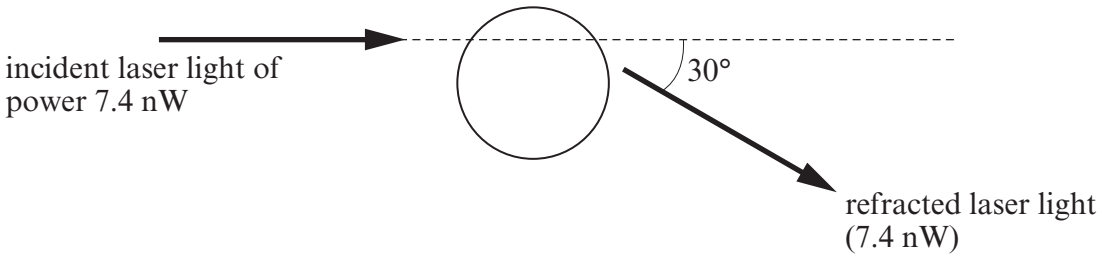
(c) Paragraph 12 states that the 7 beams, after passing through the diffraction grating, are evenly spaced. This suggests that the angles between the diffracted beams are equal. By calculating the angles of the beams to the normal, check whether or not this is true. The DVD laser has a wavelength of 640 nm and the diffraction grating has 815 lines per centimetre. [4]

(d) A sodium atom has a mass of 23 u. Use equations relating to kinetic theory to check that a sodium atom's rms velocity is 570 m s^{-1} when the temperature is 300 K (paragraph 15). [3]

(e) Explain, in your own words, why tuning the laser light 0.97 GHz below the sodium line will result in sodium atoms travelling at 570 m s^{-1} being slowed down rather than accelerated (paragraph 16). [3]

Examiner only

(f) Calculate the net vertical force acting on the spherical particle below due to the change in momentum of the incident light (paragraphs 21&22). [4]
The wavelength of the laser light is 520 nm.



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(g) Discuss some advantages and disadvantages of inertial confinement fusion (para 24).[2]

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