

- 1 (a) State Newton's law of gravitation.

Gravitational Force is directly proportional to the product of two point masses and inversely proportional to the square of distance from their centres. [2]

- (b) A satellite is in a circular orbit around a planet. The radius of the orbit is  $R$  and the period of the orbit is  $T$ . The planet is a uniform sphere.

Use Newton's law of gravitation to show that  $R$  and  $T$  are related by

$$4\pi^2 R^3 = GMT^2$$

where  $M$  is the mass of the planet and  $G$  is the gravitational constant.

In orbit

$$F_c = F_g$$

$$mR\omega^2 = \frac{GmM}{R^2}$$

$$R^3\omega^2 = GM$$

$$R^3\left[\frac{2\pi}{T}\right]^2 = GM$$

$$\frac{R^3 4\pi^2}{T^2} = GM$$

$$4\pi^2 R^3 = T^2 GM$$

$$4\pi^2 R^3 = GMT^2$$

[2]

- (c) The Earth may be considered to be a uniform sphere of mass  $5.98 \times 10^{24}$  kg and radius  $6.37 \times 10^6$  m.

A geostationary satellite is in orbit around the Earth.

Use the expression in (b) to determine the height of the satellite above the Earth's surface.

$$T^2 = \frac{4\pi^2}{GM} r^3$$

$$(24 \times 3600)^2 = \frac{4 \times (3.14)^2}{6.67 \times 10^{-11} \times 5.98 \times 10^{24}} \times r^3$$

$$r = 4.2 \times 10^7 \text{ m}$$

$$h = r - R$$

$$= 4.2 \times 10^7 - 6.37 \times 10^6$$

$$= 3.56 \times 10^7$$

height =  $3.56 \times 10^7$  m [3]

# June 2013 Physics 9702 Paper 52 Question

**CH Cherryholmes**



**June 2013 Physics 9702 Paper 52 Question:**

The Top Books of the Year June 2013 Physics 9702 Paper 52 Question The year 2023 has witnessed a noteworthy surge in literary brilliance, with numerous engrossing novels captivating the hearts of readers worldwide. Lets delve into the realm of top-selling books, exploring the fascinating narratives that have captivated audiences this year. The Must-Read : Colleen Hoover's "It Ends with Us" This poignant tale of love, loss, and resilience has gripped readers with its raw and emotional exploration of domestic abuse. Hoover masterfully weaves a story of hope and healing, reminding us that even in the darkest of times, the human spirit can prevail. June 2013 Physics 9702 Paper 52 Question : Taylor Jenkins Reids "The Seven Husbands of Evelyn Hugo" This captivating historical fiction novel unravels the life of Evelyn Hugo, a Hollywood icon who defies expectations and societal norms to pursue her dreams. Reids compelling storytelling and compelling characters transport readers to a bygone era, immersing them in a world of glamour, ambition, and self-discovery. June 2013 Physics 9702 Paper 52 Question : Delia Owens "Where the Crawdads Sing" This captivating coming-of-age story follows Kya Clark, a young woman who grows up alone in the marshes of North Carolina. Owens spins a tale of resilience, survival, and the transformative power of nature, entrancing readers with its evocative prose and mesmerizing setting. These popular novels represent just a fraction of the literary treasures that have emerged in 2023. Whether you seek tales of romance, adventure, or personal growth, the world of literature offers an abundance of compelling stories waiting to be discovered. The novel begins with Richard Popen, a bright but troubled young man, arriving at Hampden College. Richard is immediately drawn to the group of students who call themselves the Classics Club. The club is led by Henry Winter, a brilliant and charismatic young man. Henry is obsessed with Greek mythology and philosophy, and he quickly draws Richard into his world. The other members of the Classics Club are equally as fascinating. Bunny Corcoran is a wealthy and spoiled young man who is always looking for a good time. Charles Tavis is a quiet and reserved young man who is deeply in love with Henry. Camilla Macaulay is a beautiful and intelligent young woman who is drawn to the power and danger of the Classics Club. The students are all deeply in love with Morrow, and they are willing to do anything to please him. Morrow is a complex and mysterious figure, and he seems to be manipulating the students for his own purposes. As the students become more involved with Morrow, they begin to commit increasingly dangerous acts. The Secret History is a exceptional and gripping novel that will keep you wondering until the very end. The novel is a warning tale about the dangers of obsession and the power of evil.

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