

Graveney School Year 11 Physics Checklist

P5 Satellite Orbits, Motion & Momentum

Satellites, gravity and circular motion

- Gravity is a universal force of attraction between masses. Gravity keeps the Moon in orbit around the Earth and the Earth in orbit around the Sun.
- Low polar orbit satellites orbit in a few hours.
- Geostationary satellites orbit more slowly with a period of 24 hours around the equator, remaining in a fixed position above the Earth's surface.
- Satellites in low polar orbit can be used for:
 - * weather forecasting, imaging the Earth's surface, military uses
- Satellites in high geostationary orbit are used for:
 - * communications, weather forecasting, GPS;
- **Gravitational force with decreases rapidly with distance.**
- **Comet's speed up as they approach the Sun due to an increase in the force of gravity over shorter distances.**
- **The orbital period of a planet increases with increasing distance from the Sun - weaker gravitational pull - slower motion and further to travel.**
- Know that circular motion requires a centripetal force and that gravity provides the centripetal force for orbital motion.
- **Artificial satellites in lower orbits travel faster because the gravitational force is stronger.**
- **Artificial satellites are continually accelerating towards the Earth due to the Earth's gravitational pull, but that their tangential motion keeps them moving in an approximately circular orbit.**

vectors and equations of motion

- For two cars their relative speed is lower if they are moving in the same direction (relative speed is difference in speeds) but their relative speed is higher if they are moving in opposite directions (relative speed is sum of speeds).
- Know the difference between vector and scalar;
- Calculate the vector sum from vector diagrams of parallel vectors **or at right angles to each other using Pythagoras.**
- Speed is a measure of how fast an object is moving;
- Speed is a scalar quantity;

- Average speed = total distance / total time taken
- Use the equations:
 - * $v = u + at$
 - * $s = 1/2(u + v) t$
- **Higher Tier Only:**
 - * $v^2 = u^2 + 2as$
 - * $s = ut + 1/2 at^2$

projectile motion

- The trajectory of a projectile in the Earth's gravitational field is parabolic.
- The following are projectiles cannon balls, golf balls, footballs, netballs, darts and long-jumpers;
- An object projected horizontally:
 - * has a constant horizontal velocity;
 - * is accelerating towards the ground due to gravity;
- Use the equations of motion for an object projected vertically upwards under the action of gravity;
- Use the equations of motion for an object projected horizontally;
- **The resultant velocity of a projectile is the vector sum of the horizontal and vertical velocities.**

momentum

- Every action has an equal and opposite reaction;
- Use the equation:
 - * momentum = mass x velocity
- During a collision the two objects exert an equal and opposite force on each other.
- **Use the equation:**
 - * **force = change in momentum/time**
- Explain, using the ideas about momentum, the use of:
 - * crumple zones, seatbelts, airbags in cars.
- **Explain that spreading the change in momentum over a longer time:**
 - * **reduces the forces required to act;**
 - * **reduces the injury.**
- **Explain that momentum is a property that is always conserved and use that to explain:**
 - * **explosions, recoil, rocket propulsion.**

Do not keep saying to yourself, if you can possibly avoid it, 'But how can it be like that?' because you will get 'down the drain' into a blind alley from which nobody has yet escaped. Nobody knows how it can be like that.

Richard Feynman

