London Landmarks Energy Calculations for GCSE Physics

These GCSE Physics questions are based on famous London landmarks, transport systems and attractions. Some questions require more than one equation and careful thinking about energy transfers.

1. A runner in the London Marathon has a mass of 68 kg and is travelling at 5.5 m/s. Calculate the runner's kinetic energy.
2. A cyclist rides down Constitution Hill towards Buckingham Palace. The cyclist has a mass of 75 kg and a kinetic energy of 2400 J. Calculate the cyclist's speed.
3. A London black cab with a mass of 1800 kg accelerates to 15 m/s after leaving Waterloo Station. Calculate its kinetic energy.
4. A train on the Elizabeth line has a mass of 250000 kg and is travelling at 22 m/s. Calculate its kinetic energy.
5. A tourist with a mass of 70 kg climbs 311 steps to the viewing platform of The Monument, reaching a height of 62 m. Calculate the gain in gravitational potential energy.
6. A window cleaner with a mass of 80 kg is lifted 120 m up the side of The Shard. Calculate the increase in gravitational potential energy.
7. A maintenance platform carrying workers and equipment has a total mass of 350 kg. It rises 45 m up a tower in Canary Wharf. Calculate the gain in gravitational potential energy.
8. A tourist of mass 65 kg reaches the highest point of the London Eye, approximately 135 m above the ground. Calculate their gravitational potential energy relative to the ground.
9. A cyclist descends a hill in Richmond Park, losing 4500 J of gravitational potential energy. During the descent, 1200 J is transferred to thermal energy due to friction. Calculate the gain in kinetic energy.
10. A roller coaster train with a mass of 3000 kg starts from rest at the top of a 35 m hill in a London theme park.
    a) Calculate its gravitational potential energy at the top.

b) Calculate its maximum kinetic energy at the bottom if no energy is lost.

c) Calculate its speed at the bottom.

11. A spring launcher at the Science Museum stores 1800 J of elastic potential energy. It launches a 12 kg trolley. Assuming all the energy becomes kinetic energy, calculate the trolley's speed.
12. A stunt performer on London's South Bank uses an elastic launch system. The stretched cord stores 3200 J of elastic potential energy. The performer has a mass of 64 kg. Calculate the speed of the performer immediately after launch if all the energy is transferred to kinetic energy.
13. A spring used in a museum exhibit has a spring constant of 450 N/m and is stretched by 0.30 m.

    a) Calculate the elastic potential energy stored.

    b) If this energy is transferred to a 0.50 kg object, calculate its speed.
14. A giant elastic cord used for a special event in Hyde Park stores 5000 J of elastic potential energy. The spring constant is 800 N/m. Calculate the extension of the cord.
15. A maintenance lift carrying equipment with a total mass of 600 kg rises 150 m up a skyscraper in the City of London.

    a) Calculate the gain in gravitational potential energy.

    b) If the lift motor is only 75% efficient, calculate the total energy supplied to the motor.
16. A cyclist with a mass of 80 kg is travelling past Tower Bridge at 10 m/s.

    a) Calculate the cyclist's kinetic energy.

    b) The cyclist then brakes and loses 2400 J of kinetic energy. Calculate their new kinetic energy.

    c) Calculate their new speed.
17. A performer on a giant trampoline during a summer event in Hyde Park stores 2400 J of elastic potential energy in the trampoline.

    a) If all of this energy becomes gravitational potential energy, calculate the maximum height reached by a 60 kg performer.

    b) If only 75% of the elastic potential energy becomes gravitational

potential energy, calculate the actual maximum height reached.
c) Explain where the remaining energy has gone.