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Holiday Homework

Class: IGCSE-1 **Subject: PHYSICS**

1. An apple is whirled round in a horizontal circle on the end of a string which is tied to the stalk. It is whirled faster and faster and at a certain speed the apple is torn from the stalk. Why?
2. A satellite close to the Earth (at a height of about 200 km) has an orbital speed of 8 km/s. Taking the radius of the orbit as approximately equal to the Earth's radius of 6400 km, calculate the time it takes to make one orbit.
3. Racing cars are fitted with tyres called 'slicks', which have no tread pattern, for dry tracks, and with 'tread' tyres for wet tracks. Why?
4. Name the energy transfers which occur when
    a. An electric bell rings
    b. Someone speaks into a microphone
    c. A ball is thrown upwards
    d. There is a picture on a television screen
    e. A torch is on
5. How much work is done when a mass of 3 kg (weighing 30 N) is lifted vertically through 6 m?
6. A boulder of mass 4 kg rolls over a cliff and reaches the beach with a velocity of 20 m/s. Find a) the kinetic energy of the boulder as it lands.
    b) the potential energy of the boulder when it was at the top of the cliff.
    c) the height of the cliff.
7. Two students make the statements about acceleration that are given below.

    Student A: For a given mass the acceleration of an object is proportional to the resultant force applied to the object.

    Student B: For a given force the acceleration of an object is proportional to the mass of the object.

    a. One statement is correct and one is incorrect.
    Rewrite the incorrect statement, making changes so that it is now correct.
    b. State the equation which links acceleration a, resultant force F and mass m.
    c. Describe what happens to the motion of a moving object when
        i. There is no resultant force acting on it,
        ii. A resultant force is applied to it in the opposite direction to the motion,
        iii. A resultant force is applied to it in a perpendicular direction to the motion.

8. A car travels around a circular track at constant speed.
    a. Why is it incorrect to describe the circular motion as having constant velocity?
    b. A force is required to maintain the circular motion.
        i. Explain why a force is required.
        ii. In which direction does this force act?
        iii. Suggest what provides this force.
9. A boy drags a suitcase along the ground with a force of 100 N. If the frictional force opposing the motion of the suitcase is 50 N, what is the resultant forward force on the suitcase?
10. Find the size of the resultant of two forces of 5 N and 12 N acting
    a. In opposite directions to each other
    b. At 90° to each other
11. A block of mass 2 kg has a constant velocity when it is pushed along a table by a force of 5 N. When the push is increased to 9 N what is the resultant force and acceleration?
12. When the energy input to a gas- fired power station is 1000MJ, the electrical energy input is 300MJ.
    a. What is the efficiency of the power station in changing the energy in gas into electrical energy?
    b. What form does the 700 MJ of 'lost' energy take?
    c. What is the fate of the 'lost' energy?
13. Explain the following using $F = ma$.
    a. A racing car has a powerful engine and is made of strong but lightweight material.
    b. A car with a small engine can still accelerate rapidly.
14. A piece of steel has a volume of $12cm^3$ and a mass 96 g .What is its density in $^{g}/_{cm^3}$ and $^{kg}/_{m^3}$?
15. A sprint cyclist starts from rest and accelerates at 1 $^{m}/_{s^2}$ for 20 seconds. He then travels at a constant speed for 1 minute and finally decelerates at 2 $^{m}/_{s^2}$ until he stops. Find his maximum speed in $^{km}/_{h}$ and the total distance covered in metres.