Q1. The diagram below shows the orbits for two types of satellite, a polar orbit and a geostationary orbit.
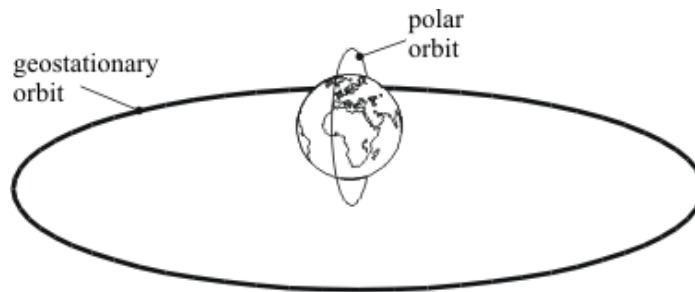

A satellite in stable Earth orbit moves at a constant speed in a circular orbit because there is a single force acting on it.

(i) What is the direction of this force?

....

(1)

(ii) What is the cause of this force?

....

(1)

(iii) What is the effect of this force on the **velocity** of the satellite?

....

(1)

(iv) In which of the orbits shown above would this force be bigger?
Explain the reason for your answer.

....

....

(2)

(v) Explain why the kinetic energy of the satellite remains constant.

....

....

....
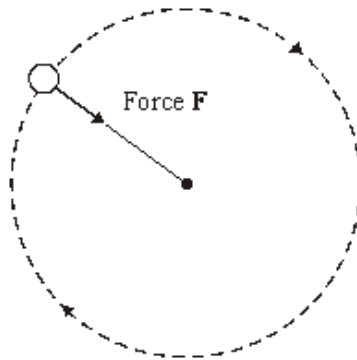
(2)
(Total 7 marks)

Q2.   (a)   A student has fastened a ball to a piece of string and is swinging it round in a horizontal circle.

(i)   The diagram below shows an overhead view of the movement of the ball.

Add an arrow, from the centre of the ball, to show the direction in which the ball would move if the string broke at this instant.

Force **F**

(1)

(ii)   Complete the table to show how force **F** changes if the student changes what he is doing. In each case, all the other factors stay the same.

If the student	Force F needs to
uses a ball with a greater mass	....
swings the ball at a greater speed	....
swings the ball with a shorter piece of string	....

(3)

(b) The Moon orbits the Earth in a circular path. Use words from the box to complete the **three** spaces in the sentence.

<div style="border:1px solid black;">

direction   resistance   speed   velocity

</div>

You may use each word once, more than once or not at all.

The Moon's .... is constant but its .... changes

because its .... changes.

(2)

(c) When any object moves in a circular, or nearly circular, path a force must act towards the centre of the circle.

(i) What word is used to describe this force?

....

(1)

(ii) The Moon orbits the Earth. What provides the force towards the Earth?

....

(1)

(iii) In an atom, name the particles which are moving in circular paths around the nucleus.

....

(1)
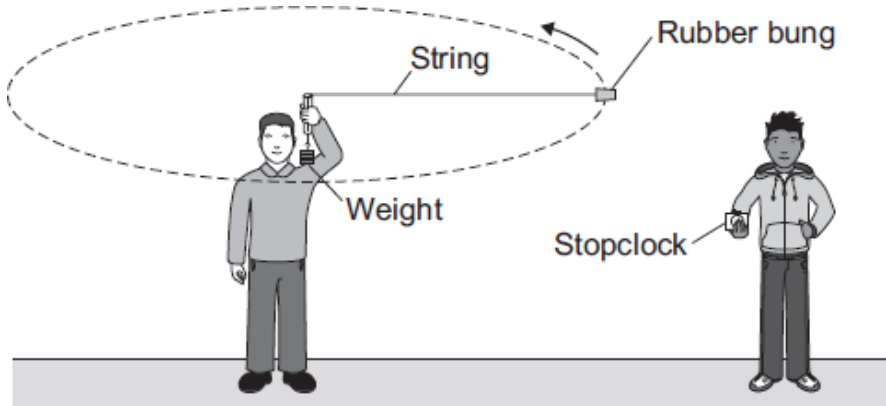
(iv) In the case of an atom, what word describes the forces which keep these particles moving in circular paths around the nucleus?

....

(1)
(Total 10 marks)

Q3. The diagram shows the apparatus used by two students to find out how the centripetal force acting on an object affects the speed of the object.

(a) (i) In which direction does the centripetal force act on the rubber bung?

....

(1)

(ii) In this investigation, what provides the centripetal force?

....

....

(1)

(b) One student swung the rubber bung around in a circle at constant speed. The second student timed how long it took the rubber bung to complete 10 rotations. The students then calculated the speed of the rubber bung, using the radius of the circle and the time to complete one rotation. The students repeated this for several different values of centripetal force.

(i) During the investigation, the radius of the circle and the mass of the rubber bung were not changed.

Explain why.

....

....

....

....

(2)

(ii) One of the variables in this investigation was the time taken by the rubber bung to complete 10 rotations.

Which **two** words can be used to describe this variable?

Draw a ring around each of your **two** answers.

continuous   control   dependent   independent
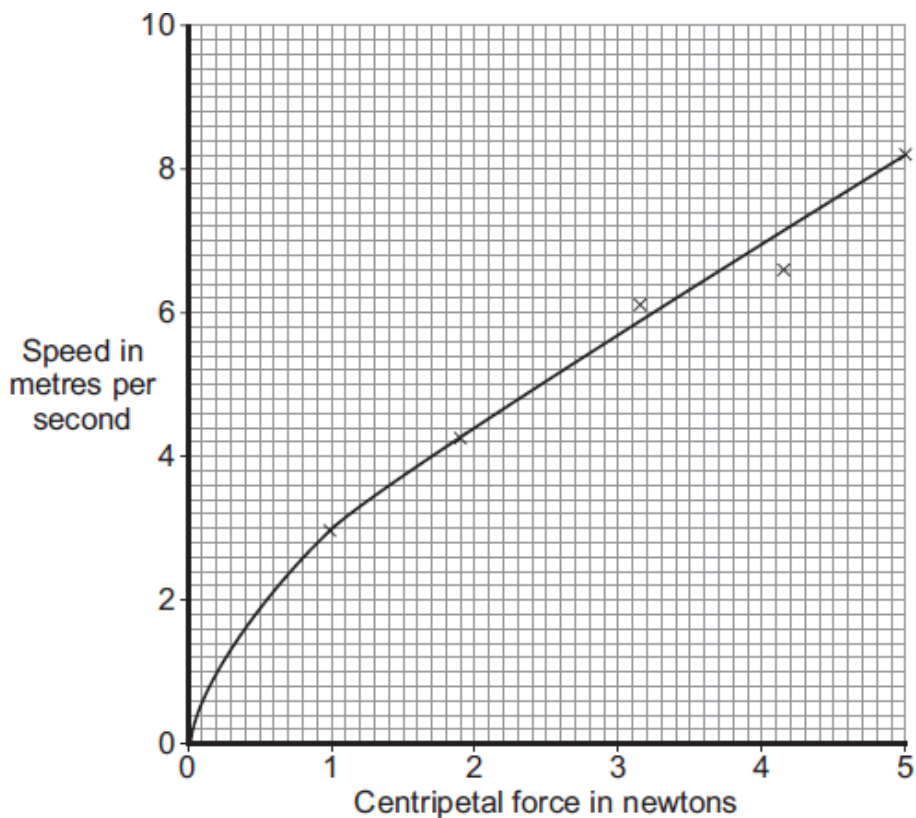
(1)

(iii)   The students timed 10 rotations of the rubber bung, rather than just one rotation.

Suggest why.

....

....

(1)

(c)   The graph shows the students' data.

There is a relationship between the speed of an object moving in a circle and the centripetal force acting on the object.

What conclusion about this relationship can the students make from their data?

....

....

(1)

(d)   The diagram shows a satellite in a circular orbit above the Earth.
      The satellite is part of the global positioning system (GPS).
      The satellite orbits the Earth **twice** every 24 hours.
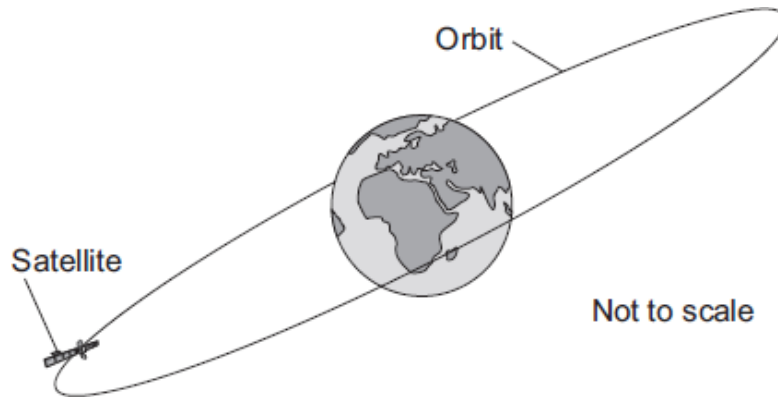
(i)   What provides the centripetal force needed to keep the satellite in its orbit around the
       Earth?

       ....

                                                                                                            (1)

(ii)   Is this satellite in a geostationary orbit?

       Draw a ring around your answer.   **Yes   No**

       Give a reason for your answer.

       ....

       ....

                                                                                                            (1)
                                                                                                 (Total 9 marks)