Name of the Student:_____
Max. Marks : 22 Marks **Time : 22 Minutes**

Q1.

The figure below shows some bumper cars.

Bumper cars are designed to withstand collisions at low speeds.



(a) During a collision between a bumper car and the barrier, the bumper car and barrier act as a closed system.

What is meant by a 'closed system'?

_____

_____

_____

(1)

(b) How does Newton's Third Law of motion apply to the collision between the bumper car and the barrier?

_____

_____

_____

(1)

(c) During the collision, the change in momentum of the bumper car is 700 kg m/s.

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The time taken for the collision is 0.28 s.

Calculate the force on the bumper car during the collision.

Use the Physics Equations Sheet.

Force = _____ N

(2)

(d) The bumper car has a flexible bumper.

Explain how the flexible bumper reduces the risk of injury to the people in the bumper car during the collision.

(3)

(e) A bumper car moved with an initial constant velocity and then accelerated at 2.0 m/s^2.

While accelerating, the bumper car travelled a distance of 1.5 m.

The final velocity of the bumper car was 2.5 m/s.

Calculate the initial constant velocity of the bumper car.

Use the Physics Equations Sheet.

Initial constant velocity = _____ m/s

(3)

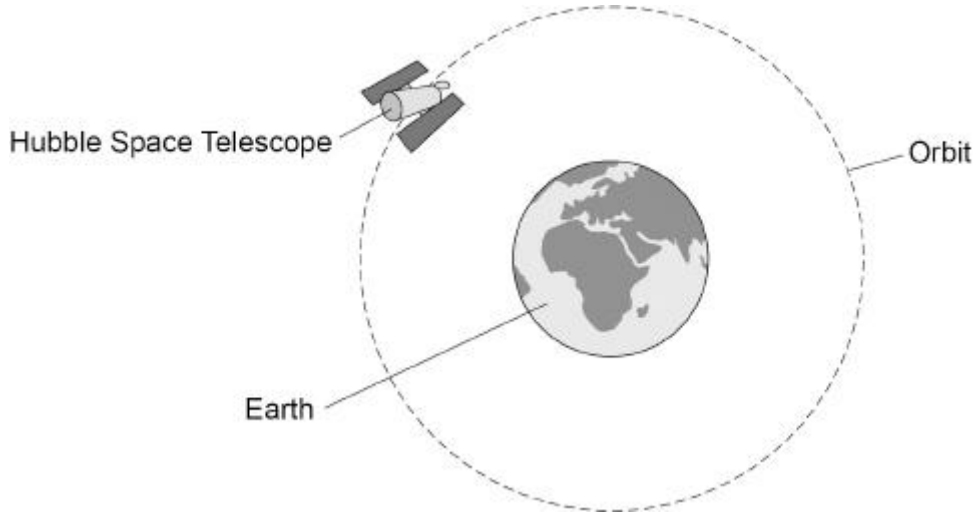
(Total 10 marks)

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Q2.

Figure 1 shows the Hubble Space Telescope orbiting the Earth.

Figure 1



(a) What name is given to objects that orbit a planet?

_____

(1)

(b) A space telescope uses microwaves to communicate with the Earth.

A microwave has a wavelength of 12.5 cm.

The speed of microwaves through space is 3.0×10^8 m/s.

Calculate the frequency of the microwave.

Use the Physics Equations Sheet.

Give your answer in standard form.

_____

_____

_____

_____

_____

_____

_____

_____

Frequency (in standard form) = _____ Hz

(5)

(c) Explain the effect of the Earth's gravitational force on the motion of the Hubble Space Telescope.

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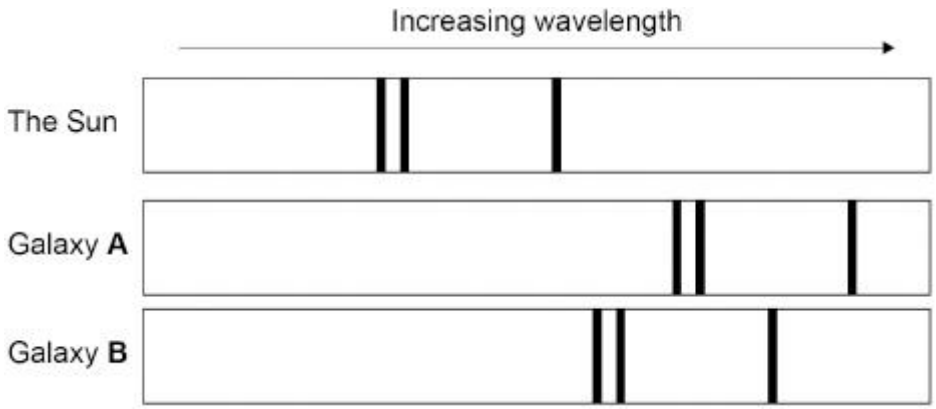
(3)

(d) The Hubble Space Telescope can detect visible light from distant galaxies.

The visible light spectra from stars and galaxies include dark lines at specific wavelengths.

Figure 2 shows the visible light spectra from the Sun and two galaxies.

Figure 2



Explain what conclusions can be made about galaxies **A** and **B**.

(3)

(Total 12 marks)

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