Sample Paper 6 Solutions

Class IX 2022-23

Science (086)

Time: 3 Hours **Max. Marks: 80**

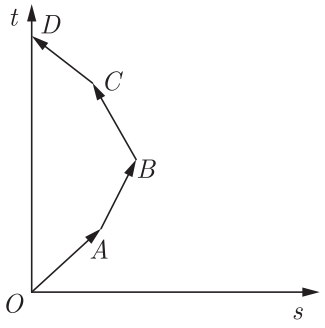
General Instructions:

1. This question paper consists of 39 questions in 5 sections.
2. All questions are compulsory. However, an internal choice is provided in some questions. A student is expected to attempt only one of these questions.
3. Section A consists of 20 Objective Type questions carrying 1 mark each.
4. Section B consists of 6 Very Short questions carrying 02 marks each. Answers to these questions should in the range of 30 to 50 words.
5. Section C consists of 7 Short Answer type questions carrying 03 marks each. Answers to these questions should in the range of 50 to 80 words.
6. Section D consists of 3 Long Answer type questions carrying 05 marks each. Answer to these questions should be in the range of 80 to 120 words.
7. Section E consists of 3 source-based/case-based units of assessment of 04 marks each with sub-parts.

SECTION-A

Select and write one most appropriate option out of the four options given for each of the questions 1 – 20.

1. Which of the following options is correct for the object having a straight line motion represented by the following graph?



(a) The object moves with constantly increasing velocity from O to A and then it moves with constant velocity.

(b) Velocity of the object increases uniformly.

(c) Average velocity is zero.

(d) The graph shown is impossible.

Ans : (c) Average velocity is zero.

From given, it is clear that the net displacement is zero. So, average velocity will also be zero.

2. A hockey player pushes the ball on the ground. It comes to rest after travelling certain distance because

(a) the player stops pushing the ball.

(b) balanced force acts on the ball.

(c) the opposing force acts on the ball.

(d) none of these

Ans : (c) the opposing force acts on the ball.

The opposing force of friction acts on the ball.

3. The shortest airline route from Moscow in Russia to Montreal in Canada is likely to be which of these shown on the world map?

(a) A
(b) B
(c) C
(d) D

Ans : (d) D

4. A rocket rises up in air due to the force generated by the fuel. The work done by the
(a) fuel is negative work and by force of gravity is positive work
(b) fuel is positive work and by force of gravity is negative work
(c) both fuel and force of gravity do positive work
(d) both fuel and force of gravity do negative work

Ans : (b) fuel is positive work and by force of gravity is negative work

As the rocket moves in the direction of force generated by fuel, therefore it is positive work. As the force of gravity acts in the direction opposite to the displacement, therefore, it is negative work.

5. The membrane of a drum vibrates to produce sound. Similarly the string of a sitar vibrates to produce sound. Which part of a whistle vibrates to produce sound?
(a) Body of whistle
(b) Air column
(c) Mouth of the person
(d) All of these

Ans : (b) Air column

Whistle has a air column which vibrates and produce sound.

6. Which of the following cell organelles can make complex sugars from simple sugars?
(a) Ribosomes
(b) Lysosomes
(c) Endoplasmic reticulum
(d) Golgi apparatus

Ans : (a) Ribosomes

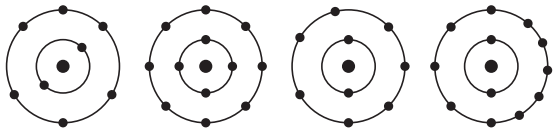
The Golgi apparatus, first described by Camillo Golgi. Its functions include the storage, modification and packaging of products in vesicles. In some cases, complex sugars may be made from simple sugars in the Golgi apparatus. The Golgi apparatus is also involved in the formation of lysosomes.

7. Which of these features is associated with plasma membrane?
(a) Permeable
(b) Impermeable
(c) Selectively permeable
(d) Both (a) and (b)

Ans : (c) Selectively permeable

The plasma membrane allows the entry and exit of certain materials, in and out of the cell. It also prevents the movement of some other materials. Some substances like carbon-dioxide or oxygen move across the cell membrane by process called diffusion. On the other hand, substances like water moves across the cell membrane through the process called osmosis. Therefore, the cell membrane is called a selectively permeable membrane.

8. Which of the following do not represent Bohr's model of an atom correctly?



(i) (ii) (iii) (iv)

(a) 1 and 2 (b) 2 and 3
(c) 2 and 4 (d) 1 and 4

Ans : (c) 2 and 4

First shell can accommodate maximum of two electrons and second shell can accommodate maximum of eight electrons.

9. The total number of electrons present in 16 g of methane gas is
(a) 96.352×10^{23} (b) 48.176×10^{23}
(c) 60.22×10^{23} (d) 30.110×10^{23}

Ans : (c) 60.22×10^{23}

Total no. of electrons in 16 g i.e., 1 mole of CH_4

$= 10 \times 6.022 \times 10^{23}$ electrons

$= 60.22 \times 10^{23}$ electrons

10. Soda water is a solution of carbon-dioxide in water. What is this solution composed of?
(a) Liquid solute in a gaseous solvent
(b) Gaseous solute in a liquid solvent
(c) Liquid solute in a liquid solvent
(d) Gas in suspended form in liquid

Ans : (b) Gaseous solute in a liquid solvent

Carbon-dioxide acts a solute in soda water.

11. To separate the solids which are insoluble in liquids such that solid is heavier than liquid:
(a) sedimentation and decantation
(b) evaporation and condensation
(c) filtration
(d) condensation and crystallization

Ans : (a) sedimentation and decantation

Solids which are insoluble in liquids but heavier that liquids can be allowed to sediment and the liquid can be decanted.

12. When a beam of light is passed through a colloidal solution, it gets
(a) reflected (b) absorbed
(c) scattered (d) refracted

Ans : (c) scattered

The scattering of beam of light on passing through colloidal solution is known as Tyndall effect.

13. What mass of carbon-dioxide (CO_2) will contain 3.011×10^{23} molecules?
(a) 11.0 g (b) 22.0 g
(c) 4.4 g (d) 44.0 g

Ans : (b) 22.0 g

6.022×10^{23} molecules of CO_2 corresponds to 44 g

3.011×10^{23} molecules of CO_2 corresponds to $= 22$ g

14. What is the function of the central vacuole in plants?
(a) Stores water and dissolved nutrients
(b) Carries out photosynthesis
(c) Releases energy from stored nutrients
(d) Protects the genetic material of the cell

Ans : (a) Stores water and dissolved nutrients

The central vacuole in plants has a storage function. It consists of cell sap that has dissolved sugars, mineral salts and amino acids.

15. Which of these types of cells is most likely to divide?
(a) Epidermis (b) Parenchyma
(c) Meristem (d) Xylem

Ans : (c) Meristem

Meristems are the sites or regions within the plant body where formation of new meristematic cells takes place. For example, root and shoot tips.

16. The area under speed-6time graph represents a physical quantity whose unit is equal to the unit of
(a) light year (b) area
(c) volume (d) acceleration

Ans : (a) light year

The area under speed-time graph represents distance and the unit of distance is metre (m), which is same as the unit of light year ($1\text{ly} = 3.15 \times 10^7$ m).

Question no. 17 to 20 are Assertion-Reasoning based questions.

17. **Assertion :** A quick collision between two bodies is more violent than a slow collision, even when the initial and the final velocities are identical.
Reason : The rate of change of momentum determines the force.
(a) Both assertion and reason are true and reason is the correct explanation of assertion.
(b) Both assertion and reason are true but reason is not the correct explanation of assertion.
(c) Assertion is true but reason is false.
(d) Both Assertion and reason are false.

Ans : (a) Both assertion and reason are true and reason is the correct explanation of assertion.

In quick collision, time of impact is small which increases the impact of force.

18. **Assertion :** The value of acceleration due to gravity changes with the height, depth and shape of the earth.
Reason : Acceleration due to gravity is zero at the centre of the earth.
(a) Both assertion and reason are true and reason is the correct explanation of assertion.
(b) Both assertion and reason are true but reason is not the correct explanation of assertion.
(c) Assertion is true but reason is false.
(d) Both Assertion and reason are false.

Ans : (b) Both assertion and reason are true but reason is not the correct explanation of assertion.

The value of g changes with height, depth and is zero at the centre of the earth.

19. **Assertion :** Sound would travel faster on a hot summer day than on a cold winter day.
Reason : Velocity of sound is directly proportional to the square of its absolute temperature.

(a) Both assertion and reason are true and reason is the correct explanation of assertion.

(b) Both assertion and reason are true but reason is not the correct explanation of assertion.

(c) Assertion is true but reason is false.

(d) Assertion is false but reason is true.

Ans : (c) Assertion is true but reason is false.

The velocity of sound in a gas is directly proportional to the square root of its absolute temperature. Since, temperature of a hot day is more than cold winter day, therefore sound would travel faster on a hot summer day than on a cold winter day.

20. **Assertion :** A cell membrane shows fluid behaviour.
Reason : A membrane is a mosaic of lipids and proteins.

(a) Both assertion and reason are true and reason is the correct explanation of assertion.

(b) Both assertion and reason are true but reason is not the correct explanation of assertion.

(c) Assertion is true but reason is false.

(d) Assertion is false but reason is true.

Ans : (a) Both assertion and reason are true and reason is the correct explanation of assertion.

A cell membrane shows fluid behaviour. It was proved by fluid- mosaic model of a biomembrane by Singer and Nicolson in 1972. According to this model, the membrane does not have a uniform disposition of lipids and proteins but is a mosaic of the two. Further, the membrane is not solid but is quasi fluid.

SECTION-B

Question no. 21 to 26 are very short answer questions.

21. What is a pure substance ?

Ans :

A pure substance is one, which contains only one type of atoms or molecules in a specific arrangement in any part of the sample taken. Example : Water, diamond.

or

How would you prove that any colourless liquid, given to you is pure water?

Ans :

If the colourless liquid boils at 100°C, then it is pure water. This is because any pure substance has fixed boiling and melting point.

22. What is the similarity between chlorine molecule, nitrogen molecule and hydrogen molecule ?

Ans :

Chlorine molecule, nitrogen molecule and hydrogen molecule are diatomic molecules. These are formed by the union of two atoms of the same element.

23. Write the characteristics of collenchyma.

Ans :

The cells in this type of tissue are living, elongated and thickened with cellulose at the corners. There is very little inter-cellular space. This tissue provides flexibility and mechanical support to plants. This tissue is found in hypodermics of stems and leaf stalks

24. Why is G called 'a universal gravitational constant'?

Ans :

The value of G is same for any pair of objects in the universe. Also its value does not depend on the nature of the intervening medium. That is why constant G is called 'universal gravitational constant'.

25. What is a wave?

Ans :

A wave is a disturbance that travels in a medium due to repeated periodic motion of particles about their mean position – such that the disturbance is handed over from one particle to the other without the actual motion of the medium.

or

State any two characteristics of a wave motion.

Ans :

The characteristics of wave motion are :
(i) It is a periodic disturbance.
(ii) Energy transfer takes place at a constant speed.

26. Name two breeds of cows selected for long lactation period.

Ans :

After giving the birth of a calf, a cow secretes milk. The duration of milk secretion of a cow that is the period of time till which the cow secretes milk is known as lactation period. Brown Swiss and jersey are selected for their long lactation period.

SECTION-C

Question no. 27 to 33 are short answer questions.

27. What would you observe when a saturated solution of potassium chloride prepared at 60°C is allowed to cool at room temperature ?

Ans :

The given solution is a saturated solution of potassium chloride prepared at 60°C which is above the room temperature (20°C). Therefore, when it is allowed to cool at room temperature, some of the potassium chloride will settle down at the bottom, because saturation decreases with decrease in temperature and vice-versa.

28. What is the reason that "Ice has lower density than water" ?

Ans :

The mass per unit volume of a substance is called density (density = mass/volume). The density of substance decreases as the volume of a substance increases. Space between particles increases when water changes into ice. These spaces are larger as compared to the spaces present between the particles of water. Thus, the volume of ice become greater as compared to the water. Hence, the density of ice become lower than that of water. And, a substance with lower density than water can float on water. Thus, ice floats on water.

29. Explain the structure of parenchyma. What are its major modifications?

Ans :

Parenchyma : It is the basic or fundamental tissue found in plants. Cells of this tissue are thin walled, circular or polygonal. They are living with a nucleus and a vacuole. Inter-cellular spaces are present between the cells of this tissue. Two modifications of parenchyma are chlorenchyma and aerenchyma.
(a) **Chlorenchyma :** Sometimes cells of the parenchyma contain chlorophyll and perform photosynthesis. This kind of parenchyma is known as chlorenchyma.
(b) **Aerenchyma :** In aquatic plants, parenchyma contains big air spaces in between them. Such a parenchyma tissue is known as aerenchyma.

or

What are the four important types of tissues found in animal?

Ans :

The four animal tissues are :
(i) Epithelial tissues,
(ii) Connective tissues,
(iii) Muscular tissues, and
(iv) Nervous tissue.

30. (i) Name the organelle which provides turgidity and rigidity to the plant cell. Name any two substances which are present in it.
(ii) How are they useful in unicellular organisms?

Ans :

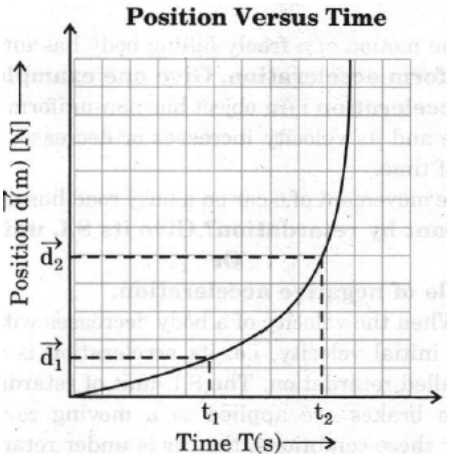
(i) Plant cells have big vacuoles full of cell sap that provide them turgidity and rigidity. Plant vacuoles store amino acids, sugars, various organic acids and some proteins.
(ii) In unicellular organism they may serve the following purposes :
1. **Forming food vacuoles :** In single celled organisms like amoeba, the food vacuole contains the food items that the amoeba has ingested. The food items are digested by the enzymes later on.
2. **Removal of excess water and wastes :** In some unicellular organisms, specialized vacuoles play important roles in expelling excess water and some wastes from the cell.

31. How can we represent the change in the position of an object with time?

Ans :

The change in the position of an object with time can be represented on the distance-time graph by

adopting a convenient scale of choice.



In this graph, time is taken along x-axis and distance is taken along y-axis.

32. Why is it difficult to achieve a zero unbalanced force in practical situations? In practice what happens to a rolling marble? How can we reduce the effect of friction on a marble?

Ans :

(i) It is difficult to achieve a zero unbalanced force because of the presence of the frictional force acting opposite to the direction of motion.
(ii) In practice, the rolling marble stops after travelling some distance.
(iii) The effect of frictional force may be reduced by using a smoother marble and a smoother plane and providing a lubricant.

or

Use law of conservation to explain why a gun recoils.

Ans :

Gun and bullet both are at rest before firing. Hence, their initial velocities are zero. So, the initial momentum of the gun and the bullet is zero before fire. When a bullet is fired from the gun, it moves forward with a large velocity. The bullet imparts an equal and opposite momentum to the gun due to which the gun recoils backwards. Thus, the final momentum of the system is zero.

33. Derive a relationship between "g" and "G".

Ans :

Let a body of mass m be dropped from a distance R from the centre of the Earth.
Therefore, F exerted by the Earth on the body is,

$$F = \frac{G \times M_e \times m}{R^2}$$

Where, M_e is the mass of the Earth then, the acceleration of the body (a) is given by

$$a = \frac{\text{Force}}{\text{Mass of the body}}$$

$$= \frac{F}{m} = \frac{G \times M_e \times m}{R^2}$$

Thus, a is independent of the mass of the object falling towards the Earth. This acceleration "a" developed by a falling object is called the acceleration due to gravity. It is denoted by "g".

$$g = \frac{G \times M_e}{R}$$

SECTION-D

Question no. 34 to 36 are Long answer questions.

34. Discuss the factors which affect evaporation.

Ans :

There are four factors which affect evaporation.
(i) **Surface area :** Escaping of particles from liquid state to vapour state depends on surface area. Therefore, the rate of evaporation increases with surface area.
(ii) **Temperature :** Rise in temperature, rise the kinetic energy of substance and therefore, chance of escaping of particles is great from liquid to vapour state.
(iii) **Wind :** The rate of evaporation increases with speed of wind.
(iv) **Humidity :** Humidity is the amount of vapour present in the air. At fixed temperature air can't hold more than fixed amount of water vapour. Therefore, the evaporation rate decreases if humidity increases in air.

or

Give difference between Evaporation and Boiling.

Ans :

	Evaporation	**Boiling**
1.	It takes place at any place.	It takes place at definite temperature called boiling point of liquid.

2.	Temperature of liquid decreases during evaporation.	Temperature of liquid does not change during boiling.
3.	Evaporation is a surface phenomenon; it takes place only at the surface of the liquid.	Boiling is the bulk phenomenon; it takes place in the whole mass of the liquid.
4.	Evaporation is a slow and silent process.	Boiling is a rapid and violent process.

35. Give difference between hypotonic solution, isotonic solution and hypertonic solution.

Ans :

The difference hypotonic solution, isotonic solution and hypertonic solution are following :

Hypotonic Solution	**Isotonic Solution**	**Hypertonic Solution**
External solution having higher concentration of water than the cell cytoplasm is known as hypotonic solution.	External solution having exactly the same concentration of water as that of cell cytoplasm is called isotonic solution.	External solution having lower concentration of water than a cell cytoplasm is called hypertonic solution.
Cell swells up in this solution.	Cell size does not alter.	Cell shrinks in this solution.

or

(a) Name the organelle which provides turgidity and rigidity to the plant cell. Name any two substances which are present in it.

(b) How are they useful in unicellular organisms?

Ans :

(a) Plant cells have big vacuoles that provide them turgidity and rigidity. Plant vacuoles store amino acids, sugars, various organic acids and some proteins.

(b) In unicellular organism they can serve the following works :

(i) **Forming food vacuoles :** In single celled organisms like amoeba, the food vacuole contains the food items that the amoeba has engulfed. After that the food items are digested by the enzymes.

(ii) **Removal of excess water and wastes :** In some unicellular organisms, vacuoles play important roles in egesting excess water and some wastes from the cell.

36. The kinetic energy of an object of mass, m moving with a velocity of 5 m s^{-1} is 25 J. What will be its kinetic energy when its velocity is doubled? What will be its kinetic energy when its velocity is increased three times?

Ans :

Given, K.E. of the object = 25 J

Velocity of the object, v = 5 m/s

As we know that,

$$\text{K.E.} = \frac{1}{2}\,\text{mv}^2$$

$$\text{m} = 2 \times \frac{\text{K.E.}}{v^2}$$

$$\text{m} = 2 \times \frac{25}{25} = 2 \text{ kg}$$

If velocity is double, $\text{v} = 2 \times 5 = 10$ m/s

$$\text{K.E. (for v = 10 m/s)} = \frac{1}{2}mv^2$$

$$= \frac{1}{2} \times 2 \times 100 = 100 \text{ J}$$

If velocity is tripled, $\text{v} = 3 \times 5 = 15$ m/s

$$\text{K.E. (for v = 15 m/s)} = \frac{1}{2}mv^2$$

$$= \frac{1}{2} \times 2 \times 225 = 225 \text{ J}$$

SECTION-E

Question no. 37 to 39 are case-based/data-based questions with 2 to 3 short sub-parts. Internal choice is provided in one of these sub-parts.

37. Substances which are made up of two or more atoms and can combine together in any ratio are known as mixtures. They do not possess any specific formula. The melting and boiling points of mixtures are not fixed. They possess properties of all the constituents present in it. The constituents of a mixture do not form a chemical bond with each other and hence, they can be separated by physical methods. Mixtures are classified into two main types, viz. homogeneous and heterogeneous mixtures.

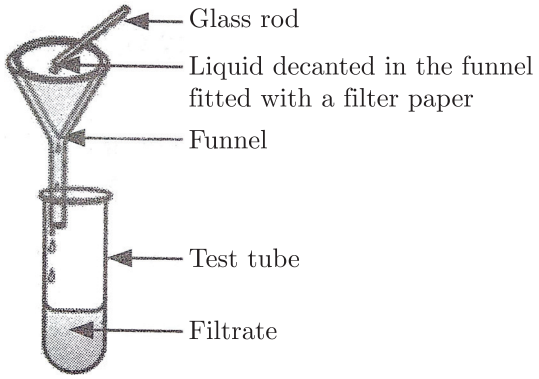
(i) What is meant by pure substance ?

(ii) Why do we need pure substances?

(iii) What is a heterogeneous?

or

(iv) Which process is shown by given diagram?



Ans :

(i) A substance that has a fixed chemical composition throughout is called a pure substance such as water, air, and nitrogen.

(ii) We need pure substances to measure accurate properties of the substance.

(iii) A heterogeneous mixture is a mixture of two or more compounds.

or

(iv) filtration

38. Cell is the building block of all living matter. Cells vary considerably with respect to their shapes, sizes, functions and types. Some cells may even change their shapes and size as per the requirement. Some cells have fixed shape which may be spherical, oval, elliptical, spindle shaped, polygonal etc. Cells of certain organisms such as Amoeba have irregular shape.

Basically, the shape of a cell is mainly dependent upon the function which it has to perform in the body of an organism. If also depends on viscosity of protoplasm and rigidity of the cell boundaries. The effects and action of neighbouring cells also affect its shape.

Cells vary largely in size. The range of cell size is from 0.1 micrometer to 100 cm. Thus, some cells can be seen through naked eye, while some cells are of microscopic size. However, the size of a particular cell remains constant. The increase in size of an organism means an increase in number of cells which by cell division, about which you will learn later.

(i) Who proposed the cell theory?

(ii) What is the cell the theory?

(iii) Which of these types of cells have fixed or peculiar shape?

or

(iv) How are body cells made?

Ans :

(i) M.J. Schleiden (1838) and Theodore Schwann (1839) proposed the cell theory which states that the basic structural and functional unit of all plants and animals is cell.

(ii) The cell theory states that all biological organisms are composed of cells ; cells are the unit of life and all life come from pre-existing life.

(iii) Cells like Amoeba have changing shapes whereas nerve cells and sperms have definite shape.

or

(iv) Two cells are formed from one cell through the process of cell division.

39. When force is applied upon a body, it may change the position, direction, velocity or state of rest of a body. Work is said to be done by an applied force upon a body if it produces a displacement in it. Hence, while you are reading, writing, singing, standing or doing any other activity in which there is no displacement, the work done in zero.

Mathematically, work done by a body describes a relation between force applied on a body (F) and displacement produced in it (s).

$$\text{Work done} = \text{Force} \times \text{Displacement}$$

or $$W = Fs$$

Work is a scalar quantity. It is described by magnitude only and has no direction. Thus, work is necessarily said to be done if a non-zero force is applied on an object to produce a non-zero displacement in it. For example, to hold a bucket and lift it above the surface by a certain height, force is applied and work is done. However, if the bucket does not move at all by applying force, then work done is zero (because displacement is zero).

Another noteworthy point in this regard is that work is directly proportional to both force applied and displacement produced in the body. Hence, greater the force applied, more is the work done upon the body. Similarly larger displacement produced in the body implies greater work done on the body.

(i) If the angle between force and displacement is θ, then for what value of θ is work done zero?

(ii) How much work done by the gravitational force of Earth on a satellite along a circular path?

(iii) Does the nature of work done depends on the direction of the applied force?

(iv) Is it possible that some force is acting on a body but still the work done is zero?

or

(v) When is work said to be done against the force of gravity?

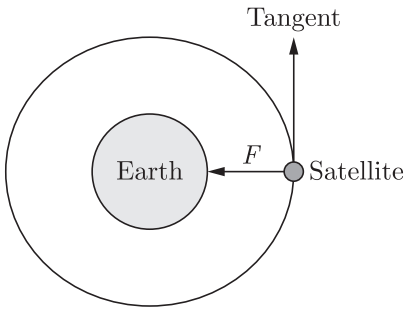
Ans :

(i)

When, $\theta = 90^\circ$,

$$\text{Work done} = Fd\cos\theta$$
$$= Fd\cos 90^\circ = 0$$

(ii) When a satellite moves around the earth, its displacement in a short interval is along the tangent to the circular path of the satellite. Since a tangent is always perpendicular to the radius, the displacement and the force are perpendicular to each other. There is no displacement of the satellite in the direction of force, i.e., $s = 0$. Thus, work done by the force of gravity on the satellite is zero as $W = F \times s = 0$.



(iii) Yes,Work done by a force can be negative, positive or zero, depending upon the direction of force applied.

(iv) Yes, when force acts at an angle of 90° with the displacement.

or

(v) When a body is lifted, the work is done against the force of gravity

□□□□□□□