

**Meghalaya Board**  
**Class IX**  
**Science and Technology**  
**Sample Paper 1 – Solution**

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**SECTION A**

**PHYSICS**

1. No, medium particles simply oscillate to and fro about their equilibrium positions.
2. 1 Joule is the amount of work done, when a force of 1 newton displaces a body by 1 meter along the line of action of force.
3. Buoyant force on an object is equal to the weight of the liquid displaced by the object. This is given by Archimedes' principle.
4. The book exerts action force on the table equal to its weight in the downward direction. The table exerts an equal force (reaction force) on the book in the upward direction.
5. Yes, The above given condition is possible.  
E.g. When a stone tied to a string is whirled in a circular path, the acceleration acting on it is always at right angle to the direction of motion of stone.
6. Average speed is the ratio of the total distance travelled by the body to the total time of journey, it is never zero.  
If the velocity of a body moving in a particular direction changes with time, then the ratio of displacement to the time taken in entire journey is called its average velocity.
7. The sheet of tin sinks in water because the density of tin is higher than that of water. When the same sheet of tin is converted into a box or a boat, then due to the trapping of lot of 'light' air in the box or boat, the average density of the box or boat made of tin sheet becomes lower than that of water and hence it floats in water.
8. When a car is moving from rest, its initial velocity ( $u$ ) is zero.  
The distance travelled ( $s$ ) by this car can be found by using the second equation of motion.

$$u = 0 \text{ m/s}$$

$$a = 2 \text{ m/s}$$

$$t = 10 \text{ min} = 600 \text{ secs}$$

To find the distance we use

$$s = ut + \frac{1}{2}at^2$$

$$\therefore s = (0) \cdot 600 + \frac{1}{2}(2) \cdot (600)^2$$

$$s = 360000 \text{ m} = 360 \text{ km.}$$

Therefore, the distance travelled by this car is 360 km.

Calculating the speed of this car,

$$\text{Speed} = \frac{\text{Distance}}{\text{time}} = \frac{360000}{600} = 600 \text{ m/s}$$

The speed of this car is 600 m/s.

9. Force (F) acting between the Earth (mass M) and the stone of mass (m) separated by the distance (r) by universal law of gravitation is given by the

equation 
$$F = G \times \frac{M \cdot m}{r^2}.$$

The mass of stone is too less (negligible) when compared to the mass of the Earth which is  $6 \times 10^{24}$  kg. Thus, the stone falls on the Earth and the Earth does not rise towards the Sun.

10.

Longitudinal waves	Transverse waves
Longitudinal waves are the waves in which the medium particles vibrate in a straight line parallel to the direction of wave propagation.	Transverse waves are the waves in which the medium particles vibrate at right angles to the direction of wave propagation.
In longitudinal waves, alternate compressions and rarefactions are formed.	In transverse waves, alternate crests and troughs are formed.
Examples: Sound waves	Example: Light waves

- 11.** The pressure is the ratio of force (F) exerted by a body to the area (A) upon which the body is exerting the force. Also, weight (W) is the force exerted by a body due to the earth's gravitational pull, i.e.  $F = W$ .

$$W = mg$$

$$\text{Acceleration due to gravity (g)} = 10 \text{ m/s}^2$$

$$\therefore W = 8 \times 10 = 80 \text{ N}$$

$$\text{Pressure (P)} = \frac{\text{Force (F)}}{\text{Area (A)}}$$

$$\text{Area of the surface of the cuboid (A)} = \ell \times b$$

Assuming the surface of  $50 \times 20$  cm to be in contact with the floor.

$$A = 50 \times 20 = 1000 \text{ cm}^2 = 0.1 \text{ m}^2$$

$$\therefore P = \frac{80}{0.1} = 800 \text{ N/m}^2$$

The pressure exerted by the block on the floors is  $800 \text{ N/m}^2$ .

**Or**

The force of gravitation is calculated by using the equation

$$F = G \times \frac{M \cdot m}{r^2}$$

$$\text{Gravitation constant } G = 6.7 \times 10^{-11} \text{ Nm}^2 / \text{kg}^2$$

$$\text{Mass of the Earth} = 6 \times 10^{24} \text{ kg}$$

$$\text{Mass of ball} = 2 \text{ kg}$$

As the ball is lying on the floor, the distance between the ball and the Earth is equal to the radius of the Earth.

Substituting all the relevant values in the above equation

$$F = 6.7 \times 10^{-11} \times \frac{6 \times 10^{24} \times 2}{(6400)^2}$$

$$F = 19.6 \text{ N}$$

$$\therefore F = 19.6 \text{ N}$$

12.

(a)

Work (W) done by a force (F) is given by

$$W = F \times s \cos\theta$$

The range of angle 'θ' in simple trigonometry is from 0° to 90°

$$\cos 0 = 1 \text{ and } \cos 90 = 0$$

Therefore, as the angle between direction of force and direction of motion increases, the work done by a force reduces.

(b)

Work (W) = Force (F) × Displacement (s) ... (1)

$$\text{Force (F)} = 5 \times 10^{10} \text{ N}$$

In this case of motion, the displacement of the car is equal to the distance travelled by the car.

$$\text{Speed (s)} = \frac{\text{Distance}}{\text{time}} = \frac{\text{Displacement}}{\text{time}}$$

$$\text{Speed (s)} = 10 \text{ m/s}$$

$$\text{Time of motion (t)} = 2 \text{ min} = 120 \text{ secs}$$

$$\therefore \text{Displacement (s)} = 1200 \text{ m}$$

Substituting the above value of displacement in equation (1)

$$\text{Work done} = 5 \times 10^{10} \times 1200 = 6 \times 10^{13} \text{ J}$$

Therefore, work done by the car to reach the river side is  $6 \times 10^{13}$  joules.

**Or**

(a)

Weight of man on the Earth ( $W_{\text{Earth}}$ ) = 300 N

acceleration due to gravity ( $g_{\text{Earth}}$ ) = 10 m/s<sup>2</sup>

Weight  $\propto$  acceleration due to gravity

$$W_{\text{Earth}} = m_{\text{Earth}} \times g_{\text{Earth}}$$

$$\therefore m_{\text{Earth}} = \frac{300}{10} = 30 \text{ kg}$$

Weight of man on the moon ( $W_{\text{moon}}$ ) = 50 N

$$\therefore \frac{W_{\text{Moon}}}{W_{\text{Earth}}} = \frac{50}{300} = \frac{1}{6}$$

$$\therefore \frac{m_{\text{moon}}}{m_{\text{Earth}}} = \frac{1}{6}$$

$$\frac{m_{\text{moon}}}{30} = \frac{1}{6}$$

$$\therefore m_{\text{moon}} = 5 \text{ kg}$$

Therefore, the mass of the man on the Moon is 5 kg.

(b) We know that

$$\text{Speed of sound in air (v)} = \frac{\text{Distance}}{\text{time}}$$

$$330 = \frac{\text{Distance}}{2}$$

$$\therefore \text{Distance} = 660 \text{ m}$$

Therefore, the distance between the man and the point of lightning is 660 m.

### SECTION B CHEMISTRY

- 13.** The subatomic particles of an atom present inside the nucleus are proton and neutron.
- 14.** According to law of constant proportion, in a chemical substance the elements are always present in a definite proportion by mass.
- 15.** When a piece of paper is burnt, entirely new substances like carbon dioxide, water vapour, smoke and ash are formed. Hence, burning of paper is a chemical change.
- 16.** On a hot day, when our body temperature tends to rise too much, our sweat glands give out moisture (sweat) on our skin. When this sweat evaporates, it takes the latent heat of vaporisation from our body hence making our body cool.
- 17.** Nanometre is a very, very small unit of measuring length. It is written as nm.  
 1 nanometre =  $1/10^9$  metre  
 So, 1 nm =  $10^{-9}$  m.  
 Atomic radius of C = 0.077 nm  
 So, atomic radius of C in m =  $0.077 \times 10^{-9}$  nm.
- 18.** Distribution of electrons in helium atom (atomic number=2) is 2. It has 2 electrons in its first energy level.  
 Distribution of electrons in hydrogen atom (atomic number=1) is 1. It has 1 electron in its first energy level.

**19.**

- (a) Most of the rays passed through thin gold foil undeviated.
- (b) Very few rays returned in the same path.
- (c) Some rays deflected through larger angles

**20.**

- (a) Clothes are washed with soap or detergent solution. This solution is hypertonic because it contains low water concentration as compared to the osmotic concentration of our skin cells.
- (b) Therefore, when skin cells come in contact with the detergent solution, they begin to lose more water by exosmosis after some time.
- (c) As a result, the skin over the fingers shrinks while washing clothes for a long time.

**21.** Mass of silver in the ornament = m gram

$$\text{Mass of gold in the ornament} = m \times \frac{1}{100} = 0.01 \text{ m gram}$$

108 g of Ag contains  $6.022 \times 10^{23}$  atoms

m gram of Ag contains  $(6.022 \times 10^{23} / 108) \times m / 100$  atoms

ratio of number of atoms of gold and silver = Au : Ag

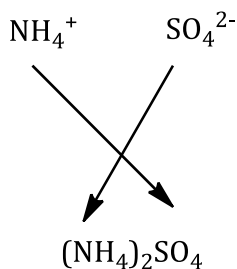
$$= (6.022 \times 10^{23} / 197) \times m / 100 : (6.022 \times 10^{23} \times m) / 108$$

$$= 108 : 19700$$

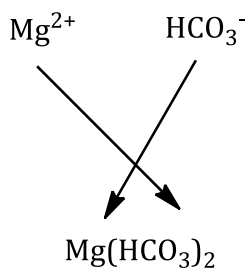
$$= 1 : 182.41$$

**Or**

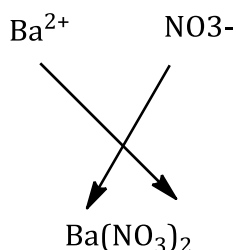
(a)



(b)



(c)



**22.** A mixture of ammonium chloride and common salt can be separated using sublimation. The mixture is taken in a china dish and placed on a tripod stand. The china dish is covered with an inverted glass funnel. A loose cotton plug is put in the upper, open end of the funnel to prevent the ammonium chloride vapours from escaping into the atmosphere. The china dish is heated by using a burner. On heating the mixture, ammonium chloride changes into white vapours. These vapours rise up and get converted into solid ammonium chloride on coming in contact with the cold, inner walls of the funnel. Hence, pure ammonium chloride collects on the inner sides of the funnel in the form of sublimate and can be removed. Common salt remains behind in the china dish.

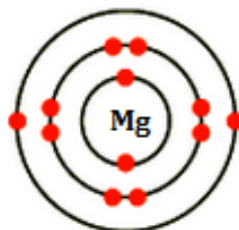
**23.**

True Solution	Colloid
A true solution is a homogeneous mixture of two or more substances.	A colloidal solution is a heterogeneous mixture of two substances.
Size of the particles is less than one nanometre.	Range of particle size is from 1 to 100 nanometre.
It is always transparent.	It is translucent.
Particles cannot be seen even with a microscope.	Particles of a colloidal solution can be seen with a microscope.
It does not show Tyndall effect.	It shows Tyndall effect.

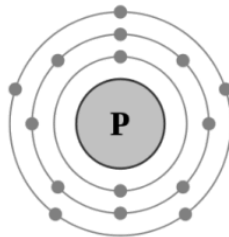
**Or**

(a) An atom has an octet when it has 8 electrons in the outermost shell. An element can attain its octet by losing, gaining or sharing electrons.

(b) Magnesium atom: 12 n, 12 p, 12 e



Phosphorus atom: 16 n, 15 p, 15 e



**SECTION C**  
**BIOLOGY**

- 24.** The practice of growing two or more crops simultaneously in the same field in a definite row pattern is called intercropping.
- 25.** Movement of nutrient elements through the living and non-living components of the biosphere is called a biogeochemical cycle
- 26.** Guard cells regulate the opening and closing of stomata to facilitate gas exchange and control transpiration in plants.
- 27.** Jaundice is most often the result of a disorder affecting the liver.
- 28.** Human activities which could lead to an increase in carbon dioxide content of air:
- (a) Burning of fossil fuels such as coal and petroleum
  - (b) Deforestation
  - (c) Burning associated with agricultural practices
- 29.** In poultry farming, domestic fowls are raised to produce eggs and meat. The fowls are given animal feeds in the form of roughage which is rich in fibre. Thus, by feeding the poultry fibre-rich diet, they provide highly nutritious food in the form of eggs and meat.
- 30.** The pteridophytes complete their life cycle in two phases, gametophytic phase or gamete-producing phase and sporophytic phase or spore-producing phase.
- 31.** The tissue present in the hard covering of seeds is sclerenchyma tissue. Lignin is the chemical which is responsible for making the tissue hard.
- 32.** Chloroplast is a green pigment which helps in photosynthesis whereas leucoplast is colourless which helps in storage of proteins and starch.



**33. Methods of weed control:**

- (a) **Mechanical method:** It involves methods such as uprooting weeds manually, weeding with a trowel, hand hoeing, ploughing and burning.
- (b) **Chemical method:** It involves the use of chemical weed killers called herbicides or weedicides to kill or destroy weeds.
- (c) **Biological method:** It involves the deliberate use of insects or some other organisms which consume and specifically destroy weed plants.

**34.**

- (a) Carbon dioxide is required by plants to make food by photosynthesis.
- (b) It is also a greenhouse gas which traps the heat reflected by the Earth's surface and keeps the atmosphere warm.
- (c) However, when the concentration of CO<sub>2</sub> rises above normal levels, it traps more heat resulting in heating of the Earth's atmosphere and an increase in the Earth's temperature causing global warming.
- (d) Global warming is dangerous because it tends to melt polar ice and glaciers on mountains. This causes a rise in the water level of oceans and submerges several coastal areas and islands.
- (e) Therefore, although carbon dioxide is essential for plants, it can act as a pollutant in case of excess concentrations.

**35.**

- (a) AIDS (acquired immunodeficiency syndrome)
- (b) Retrovirus called HIV (human immunodeficiency virus)
- (c) Modes of transmission of the disease:
  - (i) Unprotected sexual contact with an HIV-infected person
  - (ii) Transfusion of blood contaminated with HIV

**Or**

The signs and symptoms of any disease depend on the organ or tissues from the targets of the pathogens that cause the infectious diseases. The pathogens damage the targeted organs or tissues which in turn give rise to signs and symptoms. For example, if the lungs are the targets, then symptoms will be cough and breathlessness. If the liver is targeted, there will be jaundice.

36.

(a)

- (i) **Bilateral symmetry:** The type of body symmetry in which the two sides of the body are mirror images of one another is called bilateral symmetry. Example: Earthworm
- (ii) **Coelom:** Body cavity lined with an epithelium derived from the mesoderm is called coelom. Example: Spider
- (iii) **Diploblastic:** Animals which have two germ layers—outer ectoderm and inner endoderm—in the embryo are said to be diploblastic. Example: *Hydra*

(b)

- (i) Echinodermata
- (ii) Arachnida