

CBSE
Class IX Science
Sample Paper – 5 Solution

Section A

1. *Rhizobium leguminosarum*
2. Crop rotation

Section B

3. i) When an object exerts a force on another object, the second object exerts an equal and opposite force on the first object.
ii) The third law of motion also holds true for the force of gravitation, i.e. when the Earth exerts a force of attraction on an object, the object exerts the same force on the Earth in the opposite direction.

OR

- (i) Force constant
 - (ii) Gravitational
4. Particles which constitute the nucleus are called nucleons.
Protons and neutrons are the nucleons.
Atomic number of sodium is 11.
Atomic mass of sodium is 23.
No. of neutrons = $23 - 11 = 12$
No. of nucleons = 23
 5.
 - In animals, subcutaneous fat functions as an insulating layer which prevents heat loss from the body in the cold environment.
 - So, animals in colder regions possess a thicker layer of adipose tissue to insulate their body against the extreme cold.
 - Fat also acts as a source of reserve food during periods of food scarcity.

Section C

6.

- (a) Vacuole
- (b) Golgi apparatus/Golgi body
- (c) Mitochondria

7.

- (a) Jointed appendages: Phylum Arthropoda
- (b) Locomotion by setae: Phylum Annelida
- (c) Body perforated with numerous pores: Phylum Porifera

OR

Differences between bony fish and cartilaginous fish:

Bony fish	Cartilaginous fish
1. Bony endoskeleton	1. Cartilaginous endoskeleton
2. Contain four pairs of gill slits	2. Contain five–seven pairs of gill slits
3. Mouth is terminal	3. Mouth is ventral
4. Caudal fin is homocercal	4. Caudal fin is heterocercal
5. Air bladder is present	5. Air bladder is absent
6. Examples: Sea horse, carp	6. Examples: Electric ray, sting ray

8.

- (i) To make the net force a balanced force, 10 N must be added to F_1 .

$$20 \text{ N} + 10 \text{ N} = 30 \text{ N}$$

- (ii) To move the object along the direction of F_1 , it has to be exceeded by 20 N so that it becomes greater than F_2 . So, now F_1 becomes 40 N.

- (iii) After carrying out the condition given in question (ii),

$$F = 40 \text{ N}$$

$$\text{So, net force} = F = F_1 - F_2 = 40 \text{ N} - 30 \text{ N} = 10 \text{ N.}$$

$$\text{Acceleration } F = ma$$

$$\rightarrow F = 10 \text{ N}$$

$$a = \frac{10}{10} = 1 \text{ ms}^{-2}$$

- 9. The bouncing back of sound when it strikes a hard surface is called reflection of sound.

Laws of reflection:

- i) The incident wave, reflected wave and normal all lie in the same plane.
- ii) The angle of incidence is always equal to the angle of reflection.

OR

SONAR stands for Sound Navigation And Ranging.

It is a device used to measure the distance, the direction and the speed of the objects lying under water using ultrasonic waves.

It comprises a transmitter and a receiver. Powerful pulses of ultrasound waves are sent out at regular intervals from a transmitter mounted on a ship. When these pulses are intercepted by submerged objects, they are reflected. The reflected sound or echo is detected by an underwater receiver, which is also mounted on the ship.

If t = time interval between transmission and reception of reflected ultrasound waves,

v = speed of sound through water,

d = distance of the object that reflected the ultrasound, then

Distance = speed $\times$ time

In time interval ' t ', the sound waves travel twice, i.e. $2d$

$$2d = vt$$

$$\Rightarrow d = vt / 2$$

This gives the distance of the object lying under water.

10.

(a) The following factors need to be considered for fish culture:

- Topography or location of the pond
- Water resources and quality
- Soil quality
- Water temperature

(b) In composite fish culture, five or six different species of fish are grown together in a single fishpond. Fish with different food habitats are chosen so that they do not compete for food among themselves. For example, catla feed on the surface of water, rohu are middle zone feeders, mrigal and common carp are bottom feeders, and grass carp feed on weeds. This ensures complete utilisation of food resources in the pond. Such a system increases the fish yield.

11. Snakes and turtles possess the following common features:

- (a) Skin without glands
- (b) Three-chambered heart
- (c) Respiration through lungs
- (d) Cold-blooded
- (e) Hard-shelled eggs
- (f) Embryo protected by extra embryonic membranes

Since snakes and turtles share the above common features, they are both grouped under the same Class Reptilia of Phylum Chordata.

12.

Step I:

Gram molecular weight of $\text{Al}_2\text{O}_3 = 2 \times 27 + 3 \times 16 = 102 \text{ g}$

Hence, 102 g of Al_2O_3 contains = 1 mole of Al_2O_3

$$\begin{aligned} 0.051 \text{ g of } \text{Al}_2\text{O}_3 \text{ will contain} &= \frac{1}{102} \times 0.051 \\ &= 0.0005 \text{ mole of } \text{Al}_2\text{O}_3 \end{aligned}$$

Step II:

1 mole of Al_2O_3 contains Al atom = $2 \times N_0$

$$\begin{aligned} \text{So, } 0.0005 \text{ moles of } \text{Al}_2\text{O}_3 \text{ will contain} &= 2 \times 0.0005 \times 6.022 \times 10^{23} \\ &= 6.022 \times 10^{20} \text{ atoms of Al} \end{aligned}$$

The number of (Al^{3+}) ions present is the same as the number of Al atoms.

$$\therefore \text{Number of } \text{Al}^{3+} \text{ ions} = 6.022 \times 10^{20} \text{ ions}$$

OR

- (a) Calcium and oxygen
- (b) Hydrogen and bromine
- (c) Sodium, hydrogen, carbon and oxygen
- (d) Potassium, sulphur and oxygen

13.

- (i) The block of wood will float on water and a portion of it will remain submerged in water as wood has less density than water.
- (ii) The object just floats in water in such a way that its entire portion remains submerged in it.
- (iii) The glass piece sinks in water as it has more density than water.

14.

- (a) Sheetal's activity is in agreement with the law of conservation of mass.
- (b) Law of conservation of mass:
The law of conservation of mass states that mass can neither be created nor be destroyed in a chemical reaction. That is the mass of the product formed is equal to the mass of the reactants.
- (c) I like Sheetal's method. As this method is in accordance with the law and will give accurate results.

15.

Dalton's atomic theory	Modern atomic theory
(i) Atoms are indivisible particles.	(i) Atoms are divisible into sub-atomic particles like protons, neutrons and electrons.
(ii) Atoms can neither be created nor destroyed.	(ii) Atoms can be created and destroyed by nuclear fusion and fission.
(iii) The atoms of an element are alike in all respect and differ from atoms of other elements.	(iii) The atoms of an element may not be alike in all respects, as it is seen in the case of isotopes. Isotopes which are atoms of the same element having the same atomic number but different mass numbers.

Section D

16.

(a) Features of the nuclear model of an atom by Rutherford:

- There is a positively charged centre in an atom called the nucleus. Nearly all the mass of an atom resides in the nucleus.
- The electrons revolve around the nucleus in well-defined orbits.
- The size of the nucleus is very small as compared to the size of the atom.

(b) The maximum capacity of a shell to accommodate electrons is given by the general formula $2n^2$, where n is the number of a shell.

The maximum number of electrons possible in the outermost shell is 8 and that in the penultimate shell is 18.

It is not necessary for an orbit to be completed before another is formed. In fact, a new orbit is formed when the outermost shell attains 8 electrons.

17.

(a) An increase in the concentration of carbon dioxide in the atmosphere would cause the average temperature of the Earth to increase, leading to global warming.

(b)

(i) A biogeochemical cycle or nutrient cycle is the pathway by which a chemical element or molecule moves through both biotic (biosphere) and abiotic (lithosphere, atmosphere and hydrosphere) components of the Earth.

Examples of biogeochemical cycles are water cycle, nitrogen cycle, carbon cycle, sulphur cycle and phosphorous cycle. **(Any two)**

(ii) The nitrogen cycle is considered a perfect cycle in nature because the overall amount of nitrogen in the atmosphere and water bodies is always constant. The use of chemical fertilisers also maintains the nitrogen concentration in the biosphere.

18.

(i) Given: weight of the girl is $F = 500 \text{ N}$

Work done above a certain height is given by $W = mgh$

$$F = m \times g = 500 \text{ N}$$

$$\text{Thus, work done} = 500 \times 3 = 1500 \text{ joule}$$

(ii)

a) Direction of an object is changed by the applied force.

b) Size of an object is changed by the applied force.

c) Speed of an object is changed by the applied force.

19.

(i) Retardation is called deceleration or negative acceleration.

It is called negative acceleration when velocity goes on decreasing.

Retardation is a vector quantity.

(ii) Initial velocity, $u = 40 \text{ m/s}$

Final velocity, $v = 30 \text{ m/s}$

$$v = u + at$$

$$a = \frac{v - u}{t} = \frac{40 - 30}{5} = 2 \text{ m/s}^2$$

$$\text{Acceleration of the train} = 2 \text{ m/s}^2$$

(iii) Distance travelled by the train within this time:

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

$$s = 40 \times 5 + \frac{1}{2} \times 2 \times (5)^2$$

$$s = 200 + 25 = 225 \text{ m}$$

OR

Total distance travelled by the car, $d = 40 + 60 + 80 = 180 \text{ km}$

For the first 40 km journey:

Speed is 30 km/h.

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

$$\therefore t_1 = \frac{40}{30}$$

$$\therefore t_1 = 1.3 \text{ h.}$$

For the second 60 km journey:

Speed is 36 km/h.

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

$$\therefore 36 = \frac{60}{t_2}$$

$$\therefore t_2 = \frac{60}{36} = 1.6 \text{ h}$$

For the next 80 km journey:

Speed is 40 km/h.

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

$$\therefore 40 = \frac{80}{t_3}$$

$$\therefore t_3 = \frac{80}{40} = 2 \text{ h}$$

Hence, the total time taken by the car is

$$t = t_1 + t_2 + t_3$$

$$\therefore t = 1.3 + 1.6 + 2$$

$$\therefore t = 4.9 \text{ h}$$

Therefore, the average speed of the car is

$$\text{Average speed} = \frac{\text{Total distance travelled}}{\text{Total time taken}}$$

$$\therefore v_{av} = \frac{180}{4.9} = 36.73 \text{ km/h}$$

20.

(a) (i) Bromine

(ii) Oxygen

(b) Metalloid: Silicon

(c) Malleability and ductility are properties which enable us to give metals the desired shape.

(d) Mercury is a liquid at room temperature.

OR

- (a) By using a separating funnel
- (b) Chromatography
- (c) Evaporation
- (d) Magnetic separation
- (e) By using a separating funnel

21.

- (a) A person is most likely to fall ill under condition (iii) because after recovering from malaria, the person is on a four-day fast. Fasting weakens the body's immune system and the person is likely to contract chicken pox as chicken pox is a contagious disease which spreads through direct contact with the patient.
- (b) Viruses have different cell pathways as compared to bacteria. Therefore, they cannot be killed by antibiotics. Viruses have few biochemical mechanisms of their own. They enter the host cell and use their machinery for their life processes. If we have to reduce the severity of the disease, then we have to work against our body or the host cell.

OR

(a)

Blood	Lymph
It is a red-coloured connective tissue that flows from the organs to the heart and from the heart to the organs.	Lymph is a pale yellow fluid that flows from the organs to the heart.

(b)

Bone	Cartilage
It is a strong, non-flexible tissue and has a matrix made of calcium and phosphorus.	It is a strong, flexible tissue and has a matrix made of proteins and sugars.

(c)

Tendon	Ligament
It is a strong but less elastic tissue that connects the muscles to the bones.	It is a strong but highly elastic tissue that connects bone to bone.

(d)

Areolar	Adipose
It connects the skin to the lower muscles and fills the space in between the organs.	It contains fat globules, lies below the skin, absorbs external shocks and injuries, and acts as an insulator.

(e)

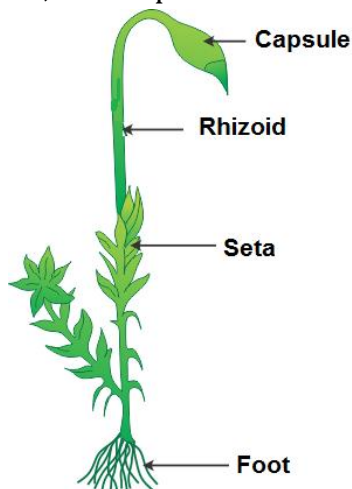
Xylem	Phloem
Xylem is made of dead cells which conduct water and minerals in plants.	Phloem has living cells which conduct food from leaves to other parts of the plant.

Section E

22.

(a) The given figure is of Funaria, a moss plant. It belongs to Division Bryophyta in Kingdom Plantae.

(b) A → Foot; B → Seta; C → Rhizoid; D → Capsule



23.

(a) Birds and fish show the presence of a post anal tail which enables us to place them in the same phylum of vertebrates.

(b) Adaptation in birds: Forelimbs are modified into wings for flight.

Adaptation in fish: Streamlined body covered with scales.

OR

Two features that we can examine to categorise a plant into monocot and dicot are number of cotyledons in a seed and leaf venation.

24.

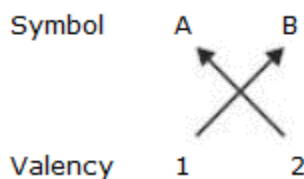
(A) Melting

(B) Vaporisation

(C) Condensation

(D) Sublimation

OR



Formula: A_2B

25. Iron filings and sulphur on heating form a compound iron sulphide.

Iron sulphide is grey.

The constituents of the compound cannot be separated by physical methods.

26. As SONAR sends ultrasonic waves through a transmitter and receives them through a receiver, the time taken to actually reach the seabed must be half of the total time taken to reach the receiver.

Hence,

$$\text{Depth of sea (d)} = \frac{\text{speed of sound in water} \times \text{time taken to reach the receiver}}{2}$$

$$\Leftrightarrow \text{Depth (d)} = \frac{1500 \times 3}{2} = 2250 \text{ metres}$$

27. The pressure of water will be the highest at point A as the pressure of water is directly proportional to the depth of the container.

Hence, as the depth of the container containing water increases, the pressure also increases.

OR

Knife A will make work easier while cutting vegetables because the surface area of the edge is lesser than knife B, i.e. knife A is sharper than knife B. Also, lesser the surface area, more is the pressure and less is the force required to be applied on the object by the chef.

$$P = \frac{F}{A}$$

Where,

P = Pressure

F = Force

A = Surface area