

**Nagaland Board
Class IX Science
Sample Paper 2 – Solution**

1.

- (a) (i) The Law of constant proportion was given by Proust in 1779.
- (b) (i) Thomson's model of an atom was proved wrong by Rutherford on the basis of alpha ray scattering experiment.
- (c) (i) On combustion, saturated carbon compounds give a clean flame while unsaturated carbon compounds give a yellow flame with lots of black soot.
- (d) (i) The given element has 3 electrons in its valence shell which implies that it is an element of 13th group.
- (e) (iv) The linear distance between two consecutive centres of compressions in a sound wave is known as wavelength.
- (f) (iii) Potential energy is defined as the energy possessed by an object on account of its position.
- (g) (iii) The cell keeps food in vacuoles whereas DNA remains in the nucleus.
- (h) (iv) Muscles in our fingers are under our control and hence we can move them according to our will.
- (i) (i) Gymnosperms are the most primitive seed plants. Pteridophytes and bryophytes do not bear seeds while angiosperms are highly evolved plants.
- (j) (i) Except cold and cough all other diseases are chronic. Cold and cough is not a chronic disease because it lasts for a short period of time (3-5 days) but rest all diseases given above continue for longer period of time (more than 3 months).

2. Evaporation is called a surface phenomena because some of the particles from the surface of the liquid gain enough energy to overcome the forces of attraction present between them and escape from the surface in the form of vapour.

3. Rutherford used gold for his scattering experiment because gold is the most malleable metal and he wanted the thinnest layer as possible; the gold sheet used was around 1000 atoms thick.

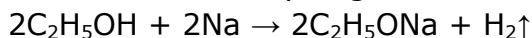
4. When the slope of distance-time graph is a straight line parallel to time axis, the object is at the same position as the time passes. That means the object is at rest.

5. Peculiar water vascular system is a characteristic feature of Phylum Echinodermata. The water vascular system helps in locomotion, food capturing, and respiration.

6. Smooth muscles are present in the alimentary canal, the iris of eye, in ureters and in the bronchi of lungs.

7. This statement is in accordance with the Law of definite proportion. Hydrogen always makes up $\frac{1}{9}$ of the mass of pure sample of water.

8. When ethanol reacts with sodium metal, sodium ethoxide is formed along with evolution of hydrogen.



9. Factors which affect the value of g : (any two)

(i) Shape of the Earth: The Earth is not perfectly spherical. It is slightly flattened at the poles and bulgy towards the equator. The value of g is maximum (9.83 m/s^2) at the poles as the polar radius is minimum, while it is minimum (9.78 m/s^2) at the equator as the equatorial radius is maximum.

(ii) Altitude: As the height (h) above the Earth's surface increases, the value of

g decreases. It varies by a value of $\frac{1}{(R+h)^2}$, where R is the radius of the Earth.

(iii) Depth: In the interior of the Earth, on an average, the value of g is less than that at the Earth's surface. As the depth below the Earth's surface increases, the value of g decreases, and finally, it becomes zero at the centre of the Earth

10.

(a) Pear consists of sclereids or stone cells.

(b) They form the gritty part of most ripe fruits and contribute hardness to the seed coat and nutshell.

(c) Therefore, when we chew a pear, we get a crunchy and granular feeling due to the presence of sclereids.

11. Immunization is the production of immunity in an individual by artificial means. The diseases against which vaccines are available are - Tuberculosis and Polio.

12.

(i) Net force $F = F_2 - F_1 = 30 - 20 = 10 \text{ N}$

(ii) Net force acts along the direction of F_2 .

(iii) Acceleration $F = ma$

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

13.

- (a) The object to be cleaned is placed in a cleaning solution. When ultrasonic waves are passed through the solution, due to their high frequency, particles of dust, dirt and grease get detached even from the unreachable portions of the object and drop out in the solution.
- (b) Crests are the elevations in a wave i.e. the position of the maximum displacement in the positive direction.

14. Yes, it is possible. A body in uniform circular motion is an example of accelerated motion. Consider the motion of the Earth around the Sun. The Earth is constantly moving in a circular path in a direction perpendicular to the gravitational pull of the Sun. So, the work done by the gravitational force is zero. Thus, the work done can be zero for an accelerated body.

15. When the bus is moving the passengers are in the state of motion and they have inertia of motion. When the bus stops suddenly, the lower part of the body of passengers, which is in contact of the bus, come to rest, but upper part of their body tends to be in the state of motion and thus the passengers lean forward.

16. Distance travelled in n seconds is

$$S_1 = un + \frac{1}{2} an^2$$

Distance travelled in $(n-1)$ seconds is

$$S_2 = u(n-1) + \frac{1}{2} a(n-1)^2$$

Distance travelled in the n^{th} second is

$$S_n = S_1 - S_2 = [un + \frac{1}{2} an^2] - [u(n-1) + \frac{1}{2} a(n-1)^2]$$

$$S_n = un + \frac{1}{2} an^2 - un + u - \frac{1}{2} an^2 + \frac{1}{2} a + an$$

$$S_n = u + a(n - \frac{1}{2})$$

17. Steps to discourage the use of alcohol:

- (i) By not getting attracted towards this habit and to stop my friends also to keep control on themselves to condemn alcoholism.
- (ii) By making poster, banners and writing articles on this issue.
- (iii) By sensitizing the people about the harmful effects of liquor consumption.

18. 1 mole of Ca = 40 g

$$\begin{aligned} \text{No. of atoms of calcium} &= \text{no. of moles} \times 6.022 \times 10^{23} \\ &= (\text{Given Mass/Molar Mass}) \times 6.022 \times 10^{23} \\ &= (125/40) \times 6.022 \times 10^{23} \\ &= 1.88 \times 10^{24} \text{ atoms} \end{aligned}$$

$$\begin{aligned} \text{No. of atoms of iron} &= (\text{Given Mass/Molar Mass}) \times 6.022 \times 10^{23} \\ &= (130/56) \times 6.022 \times 10^{23} \end{aligned}$$

$$= 1.39 \times 10^{24} \text{ atoms}$$

Calcium has more number of atoms.

$$\begin{aligned} \text{Difference in number of atoms} &= 1.88 \times 10^{24} - 1.39 \times 10^{24} \\ &= 10^{24} (1.88 - 1.39) \\ &= 0.49 \times 10^{24} \\ &= 4.9 \times 10^{23} \text{ atoms} \end{aligned}$$

OR

Mass of sodium carbonate + mass of ethanoic acid = mass of sodium ethanoate + mass of water + mass of carbon dioxide

$$5.6 \text{ g} + 7.0 \text{ g} = x + 2.8 + 0.7 \text{ g}$$

$$x = 12.6 - 3.5 = 9.1 \text{ g}$$

19. Advantages of mixed cropping:

- (a) Risk of total crop failure due to an uncertain monsoon is reduced.
- (b) Yield of crops is increased due to the complementary effect of component crops.
- (c) Fertility of the soil is improved by growing two crops simultaneously.
- (d) Chances of pest infection are greatly reduced.

Disadvantages of mixed cropping:

- (a) There is a difficulty in fertiliser application and spraying of pesticides to individual crops.
- (b) Separate harvesting and threshing of crops is not possible.
- (c) Marketing and consumption of only mixed produce are possible.

20.

- (a) Whales and fish are aquatic animals and belong to Phylum Chordata. However, they both differ in several basic characters.
- (b) Whales are warm-blooded, while fish are cold-blooded animals.
- (c) Whales respire through the lungs, while fish breathe through gills.
- (d) Whales possess mammary glands which are absent in fish.
- (e) Whales have a four-chambered heart, while fish have a two-chambered heart.
- (f) Therefore, although whales and fish resemble each other and can swim in water, whales cannot be grouped with fish.

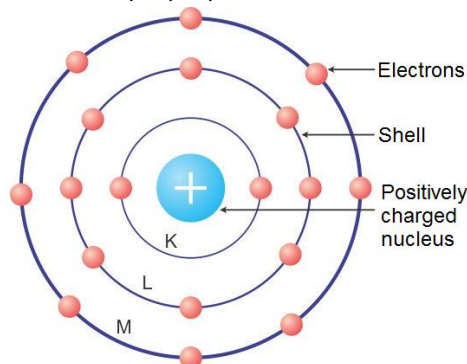
Whales belong to Class Mammalia, while fish are included in Class Pisces

- 21.** Mitochondria are called the powerhouse of the cell. During oxidation of food a large amount of energy is released by mitochondria which get stored in the form of energy rich compound called adenosine triphosphate (ATP). This energy stored in the form of ATP is used for making new chemical compounds and for performing mechanical work so it is called energy currency of the cell.

22.

(a) Niels Bohr revised Rutherford's atomic model and put forth the following suggestions:

- Niels Bohr proposed that the electrons possess a specific amount of energy which allows them to revolve around the nucleus.
- An atom contains discrete orbits which correspond to specific amount of energy. Hence, these orbits are also known as energy levels.
- The energy levels of an atom are represented as K, L, M, N and so on or the numbers $n = 1, 2, 3, 4$ and so on.



Niels Bohr's Atomic Model

- The electrons are confined to these energy levels. While revolving in these discrete orbits, the electrons do not radiate energy. Hence, these orbits are also known as stationary orbits or stationary shells. Smaller the size of the orbit, smaller is its energy.
- As we move away from the nucleus, the energy of the orbit increases progressively.
- The transfer of an electron from one orbit to another is always accompanied with the absorption or emission of energy.
- When an electron jumps from a lower energy level to a higher energy level, it absorbs energy.
- When an electron returns from a higher energy level to a lower energy level, it emits energy.

(b) Failures of Thomson's atomic model

- Although Thomson's atomic model explained why an atom is electrically neutral, it could not explain the distribution of electrons in the atom.
- If we accept that electrons are embedded in the positive charge, then the opposite electric charges should cancel each other out and the charged sphere would become chargeless.
- Thomson's model could not explain why different elements have different chemical properties.

23.

- (i) Retardation is a decrease in acceleration. This means that retardation is the rate of decrease in velocity. A positive sign of the magnitude of acceleration shows increase in velocity and a negative sign shows decrease in velocity.

$$a = \frac{v - u}{t}$$

Formula:

Example: When brakes are applied to a moving bicycle, there is retardation in its motion.

- (ii) Initial velocity, $u = 0 \text{ m/s}$

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

Time, $t = 30 \text{ minutes} = 30 \times 60 \text{ s} = 1800 \text{ s}$

$$v = u + at$$

$$a = \frac{v - u}{t} = \frac{30 - 0}{1800} = 0.016 \text{ m/s}^2$$

Acceleration of the train = 0.016 m/s^2

- (iii) Distance travelled by the train within this time.

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

$$s = 0 + \frac{1}{2} \times 0.016 \times (1800)^2$$

$$s = \frac{1}{2} \times 51840 = 25920 \text{ m} = 25.92 \text{ km}$$

OR

Total distance travelled by the train, $d = 10 + 70 + 20 = 100 \text{ km}$

For first 10 km journey:

Speed is 25 km/h

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

$$\therefore 25 = \frac{10}{t_1}$$

$$\therefore t_1 = \frac{10}{25} = 0.4 \text{ h}$$

For second 70 km journey:

Speed is 35 km/h

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

$$\therefore 35 = \frac{70}{t_2}$$

$$\therefore t_2 = \frac{70}{35} = 2 \text{ h}$$

For the final 20 km journey:

Speed is 20 km/h

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

$$\therefore 20 = \frac{20}{t_3}$$

$$\therefore t_3 = \frac{20}{20} = 1 \text{ h}$$

Hence, the total time taken by the train is

$$t = t_1 + t_2 + t_3$$

$$\therefore t = 0.4 + 2 + 1$$

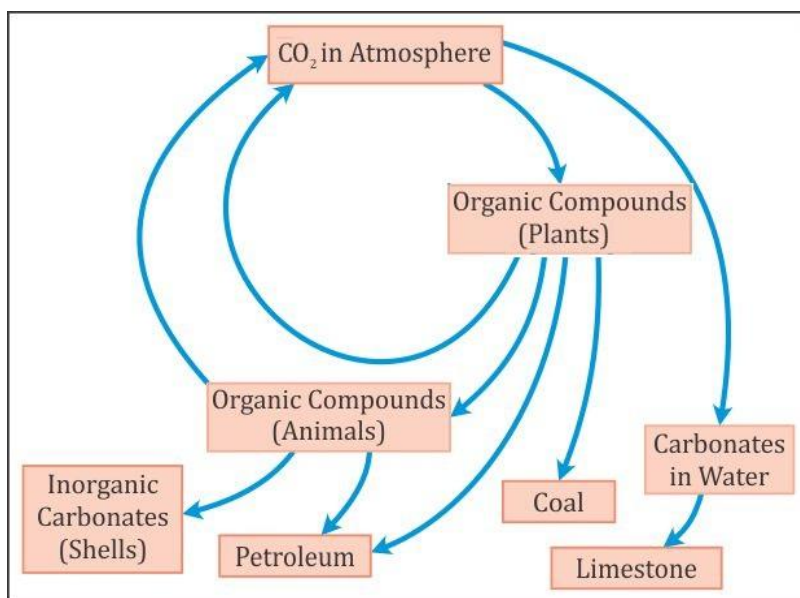
$$\therefore t = 3.4 \text{ h}$$

Therefore, the average speed of the train is

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

$$\therefore v_{av} = \frac{100}{3.4} = 29.1 \text{ km/h}$$

24. Carbon cycle



Two modes of carbon dioxide fixation:

- (i) Photosynthesis: All producers absorb CO_2 from their surroundings and convert it to glucose and other organic compounds during photosynthesis.
- (ii) Formation of shell and skeleton: Aquatic animals absorb carbonates from water and use them to build their shell and skeleton.

25.

- (a)
 - (i) Liver
 - (ii) Antibiotics block the chemical pathways of bacteria such as synthesis of cell wall and proteins, thereby killing the bacteria.
 - (iii) No, antibiotics will not help in curing Kiran's disease because hepatitis is a viral disease, while antibiotics are effective against bacteria.
- (b) There are several limitations confronted while treating an infectious disease.
 - (i) When a person gets a disease, the body functions get disturbed and may never recover completely.
 - (ii) Treatment of a disease takes time.
 - (iii) A person suffering from an infectious disease can serve as a medium for further spread of infections to other people.

Therefore, prevention of a disease is more desirable than its treatment.

26.

- (a) Coelom is body cavity. The well developed organs of the body can be accommodated into it.
- (b) Pinworms and round worms.
- (c) In Arthropods, the coelomic cavity is filled with blood. Such a condition is called haemocoel.
- (d) Mollusca;

Body cavity is haemocoel. True coelom is reduced and restricted to the pericardial cavity and the lumen of the gonads and nephridia.