

SECOND TERM EXAMINATION

SCIENCE

(Class IX)

(Tissues, Motion, Force and Law of Motion, Structure of the Atom)

Solution Paper

Section A

20 X 1 = 20

1. An element X is a metal because one electron is present in the outermost shell, i.e. 1 valence electron. When this electron is removed from the outermost shell, a cation (positive ion) will be formed with a charge of +1

2. Element X has 6 electrons in the outermost shell. In order to acquire noble gas configuration, element X, require 2 electrons. Therefore, when it gains electrons it acquires negative charge i.e -2. The charge on the anion (X^{2-}), so formed is -2.

3. Electronic configuration of ${}_{18}A = 2,8,8$

It would be chemically inert due to its complete octet.

Electronic configuration of ${}_{16}D = 2,8,6$

To complete its octet, it will gain 2 electrons, therefore it will be more reactive.

4. Mass number of calcium is 40

Mass number of argon is 40

A pair of elements having same mass number, but different atomic number is called isobars.

5. Deuterium (2_1D), number of electrons (1) = number of proton (1)
= number of neutron ($2-1 = 1$)

6. Apical meristem

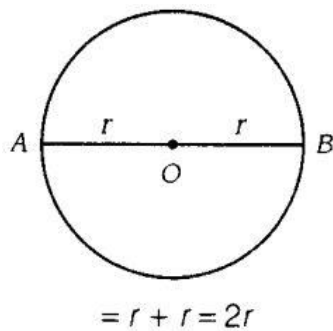
7. Parenchyma

8. Cork is impervious due to a chemical called suberin in its walls.

9. Phloem.

10. Proteins and sugars.

11. After half the circle, the particles will reach diametrically opposite point, i.e, from point A to B. Therefore, Displacement after half circle = $AB = r + r = 2r$



12.

The particle starts from A and moves northwards to B. It then moves eastwards to C and then southwards to D.

Hence, the total distance covered by the particle is

$$d = AB + BC + CD = 3 + 4 + 6 = 13 \text{ m}$$

Now, displacement is the shortest distance between the initial and the final positions. From the figure, it is clear that the displacement is $s = AD$

From the figure, using Pythagoras theorem

$$AD^2 = AE^2 + ED^2$$

$$AE = BC = 4 \text{ m}$$

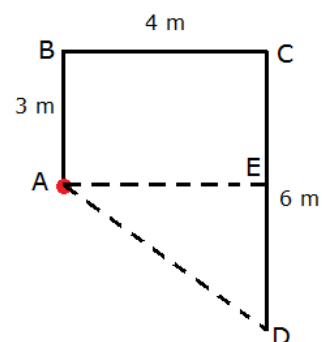
$$EC = AB = 3 \text{ m}$$

$$\therefore ED = 6 - EC = 3 \text{ m}$$

$$\therefore AD^2 = 4^2 + 3^2 = 16 + 9 = 25$$

$$\therefore AD = 5 \text{ m}$$

Hence, the displacement of the particle is 5 m.



13. It is a velocity because velocity can be positive, zero or negative while speed is always positive.

14. The numerical ratio of average velocity and average speed of an object when it is moving along a straight path is 1:1

15. As we know, velocity = slope of displacement-time graph.

Since, slope of child B is greater than all other children. Hence, child B has the highest velocity.

16. They are balanced forces so,

$$15 \text{ N} + F_2 = 25 \text{ N}$$

$$F_2 = 25 - 15$$

$$F_2 = 10 \text{ N}$$

17. The bicycle begins to slow down because of force of friction acting in opposite direction.

18. A body continues to move with the same velocity, if no unbalanced force acts on it.

19. The velocity of body is uniform, thus acceleration is zero. Hence, no unbalanced force acts on the body.

20. The goalkeeper pulls his hands backwards after holding the ball to decrease the rate of change of momentum by increasing the time.

By doing this, less force is exerted on his hands. Since, force is directly proportional to the rate of change of momentum.

Section B

15 X 3= 45

1.

Total number of α -particles used for bombardment = 1 mole

$$1 \text{ mole} = 6.022 \times 10^{23} \text{ particles.}$$

Number of α -particles deflected at angles greater than

$$50^\circ (> 50^\circ) = 1\%$$

(Given)

\therefore Number of α -particles deflected at the angles less than

$$50^\circ = 100 - 1 = 99\%$$

\therefore Actual number of α -particles deflected at the angles less than

$$\begin{aligned} 50^\circ &= \frac{99}{100} \times 6.022 \times 10^{23} \\ &= 5.96 \times 10^{23} \end{aligned}$$

2. The given statement is not correct.

According to this statement.

$$P > n > e$$

But actually, number of protons can never be greater than the number of neutrons. Number of neutrons can be equal to or greater than the number of protons because mass number is equal to double the atomic number or greater than double the atomic number.

Of course, number of neutrons can be greater than the number of electrons because number of electrons are equal to number of protons in the neutral atom.

3. The electronic configuration of Ne = K L

$$2, 8$$

Atoms, which form ions similar to neon with 3 negative charges, will have electronic configuration as = K L

$$2, 5$$

Hence, the given atoms in nitrogen,

$$\text{Mass number} = \text{number of protons} + \text{number of neutrons} = 7 + 7 = 14$$

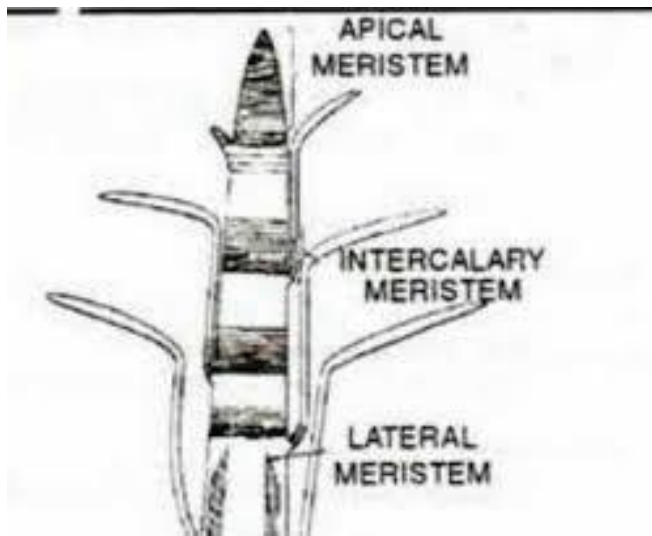
Similarly, atom which forms ion similar to neon with 3 positive charges, will have electronic configuration as = K L M

$$2, 8, 3$$

Hence the given atom in aluminium

$$\text{Mass number} = \text{number of protons} + \text{number of electrons} = 13 + 14 = 27$$

4.



Function of meristematic tissues are

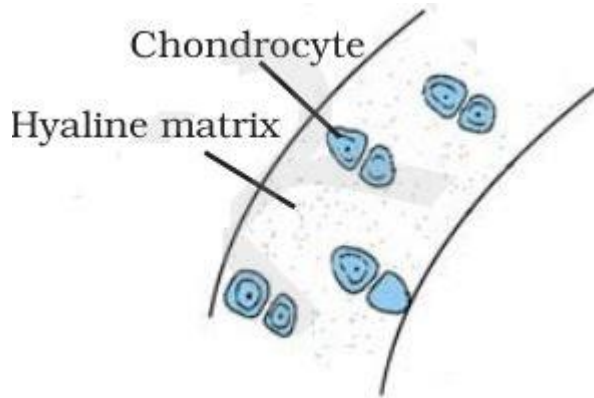
- (i) Apical meristem: It increases the length of stem and root.
- (ii) Lateral meristem: It increases the growth of stem and root
- (iii) Intercalary meristem: It increases horizontal growth of plant.

5. Major characteristics of parenchyma are as follows.

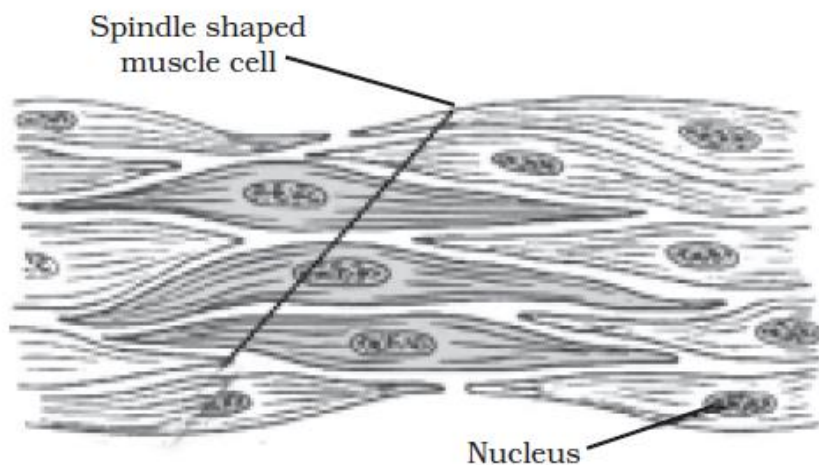
- (i) The cells of parenchyma are living and possess the power of division.
- (ii) Each parenchyma cell is isodiametric in shape with thin cell wall and encloses dense cytoplasm and small nucleus.
- (iii) The cells are loosely packed with large intercellular spaces between them.
- (iv) It is found in soft parts of plants such as cortex of roots, ground tissue in stem and mesophyll cells of leaves.
- (v) It serves as a packing tissue to fill the spaces between other tissues and maintains the shape of plants.
- (vi) It stores waste products of plant such as tannin, gum, crystals, etc.

6. Cartilage is the tissue that smoothens bone surface at joints. It is a type of connective tissue. It is an elastic tissue. It protects the joints. It is present at the joints. Nose and ear also have cartilage tissue. It secretes synovial fluid at joints which helps in lubrication of joints.

Structure: Cartilage tissue is a connective tissue that consists of a dense matrix of collagen fibres and elastic fibres embedded in a ground substance. Collagen fibres provide tensile strength and elastic fibres provide elasticity to the cartilage. The matrix is produced by cells called chondroblasts.



7.



Occurrence: These tissues are found in the walls of alimentary canal, urinary bladder, oesophagus, iris, etc.

Features:

- (i) They are unbranched and non-striated
- (ii) Cells are long, thin and spindle shaped.
- (iii) Each cell has single central nucleus.

Functions:

- (i) These muscles do not work as per our will.
- (ii) Produce movement in urinary bladder and gall bladder.

8.(i) Areolar connective tissues: These fill the space inside the organs and supports internal organs of the body. They also help in repair of tissues.

(ii) Neurons: These are the fundamental cells of nervous tissue. They are highly specialised for being stimulated and then transmitting the stimulus very rapidly from one place to another within the body.

(iii) Adipose connective tissues: These are fat storing tissue found below the skin between internal organs. The cells of this tissue are filled with fat globules. Due to storage of fats, these act as an insulator.

9. (i) Distance travelled by the cow = 15 m

(ii) Distance travelled by the bird = 30m

(iii) Displacement of the cow = 15m

Displacement of the bird = 15m so, cow and bird have same displacement.

10. (i) The line OP, i.e. the first 4 seconds indicates uniform speed. Thus the speed of the object during this time interval will be the slope of line OP.

$$= \frac{75 - 0}{4 - 0} = 18.75 \text{ m/s}$$

(ii) PQ is parallel to time axis, so speed is zero. Thus, the object is stationary between the time interval 14 s to 4 s.

Thus, the object is stationary for $14 - 4 = 10$ s.

(iii) No, it is not a real situation because distance travelled cannot decrease with time, moreover, time cannot flow backward as shown by QR part of the graph.

11. Total displacement = sum of areas of (Δ ABF+ rectangle BCGF + Δ CDE + Rectangle CEIG)

$$\left[\frac{1}{2} (AF \times FB) + (BC \times CG) + \frac{1}{2} (CE \times DJ) + (CE \times EI) \right]$$

$$= \left[\frac{1}{2} (2 \times 5) + (4 \times 5) + \frac{1}{2} (4 \times 5) + (5 \times 4) \right] = 55\text{m}$$

12. Given, the car starts from rest, so its initial velocity $u = 0$

Acceleration, $(a) = 5 \text{ ms}^{-2}$ and time $(t) = 8 \text{ s}$

From first equation of motion,

$$v = u + at$$

On putting $a = 5 \text{ ms}^{-2}$ and $t = 8 \text{ s}$ in above equation, we get

$$v = 0 + 5 \times 8 = 40 \text{ ms}^{-1}$$

So, final velocity v is 40 ms^{-1} .

Again, from second equation of motion,

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

On putting $t = 8 \text{ s}$ and $a = 5 \text{ ms}^{-2}$ in above equation, we get

$$s = 0 \times 8 + \frac{1}{2} \times 5 \times (8)^2 = \frac{1}{2} \times 5 \times 64 = 5 \times 32 = 160 \text{ m}$$

So, the distance covered in 8 s is 160m.

Given, total time $t = 12 \text{ s}$.

After 8 s, the car continues with constant velocity i.e., the car will move with a velocity of 40 ms^{-1} .

So, remaining time $t' = 12 \text{ s} - 8 \text{ s} = 4 \text{ s}$

The distance covered in the last 4s (s') = Velocity x Time [\because Distance = Velocity x Time]
 $= 40 \times 4 = 160 \text{ m}$

[We have used the direct formula because after 8 s, car is moving with constant velocity i.e., zero acceleration].

Total distance travelled in 12 s from the start

$$D = s + s' = 160 + 160 = 320 \text{ m}$$

13. (i) When water is pushed out of sprinkler with a force, then it exerts reaction force on the sprinkler causing it to rotate.

(ii) Water drops have inertia of rest. They do not move with the cloth as it is jerked and comes out.

14. The hindrance offered by the wall to the motion of bullet is called the resistance offered by the wall.

Given mass of the bullet $m=4\text{g} = 4 \times 10^{-3} \text{ kg}$.

Initial velocity, $u = 50 \text{ m/s}$, depth $s = 10\text{cm} = 1/10\text{m}$

Final velocity, $v=0$, Force , $F=?$

$$v^2 = u^2 + 2as$$

$$v^2 - u^2 = 2as$$

$$0 - (50)^2 = 2a \times 1/10$$

$$-2500 = a/5$$

$$a = -12500 \text{ m/s}^2$$

$$\text{force, } F = ma = 4 \times 10^{-3} \times (-12500) = -50\text{N}$$

Thus the average resistance offered is 50 N

Negative sign indicates that the force is acting opposite to the motion.

15. (i) $15 \text{ g}^{-\text{wt}}$

(ii) From Newtons third law, the force exerted by B on A and force exerted by A on B are equal.

(iii) Force of reaction balance A exerts on balance B and force of action balance B exerts on balance A

Section C

7 x 5 = 35

1. Given, Mass (m_1) of bullet = 20 g = 0.02 kg

Mass (m_2) of pistol = 2 kg

Initially bullet is inside the gun and it is not moving.

$$\text{Mass} = m_1 + m_2 = (0.02 + 2) \text{ kg} = 2.02 \text{ kg}$$

And $u_1 = 0$

So, Initial momentum = $2.02 \times 0 = 0 \dots (i)$

Finally let the velocity of pistol be v_2 and v_1 for bullet = 150

$$\text{Final momentum} = m_1 v_1 + m_2 v_2 = 0.02 \times 150 + 2v_2 \dots (ii)$$

We know that Initial momentum = Final momentum

$$0 = \frac{0.02 \times 150}{100} + 2v_2$$

[From equations (i) and (ii)]

$$3 + 2v_2 = 0$$

$$2v_2 = -3$$

$$v_2 = -1.5 \text{ m/s}$$

2. (i) The reason is that one cannot exert force effectively on the slippery peel of banana in the backward direction, Hence, in response the ground does not exert sufficient reaction of the force in forward direction and hence we lose our balance.

(ii) This can be explained on the law of conservation of momentum. When due to explosion some pieces move in the same particular direction, then in order to conserve momentum the remaining pieces move in the opposite direction.

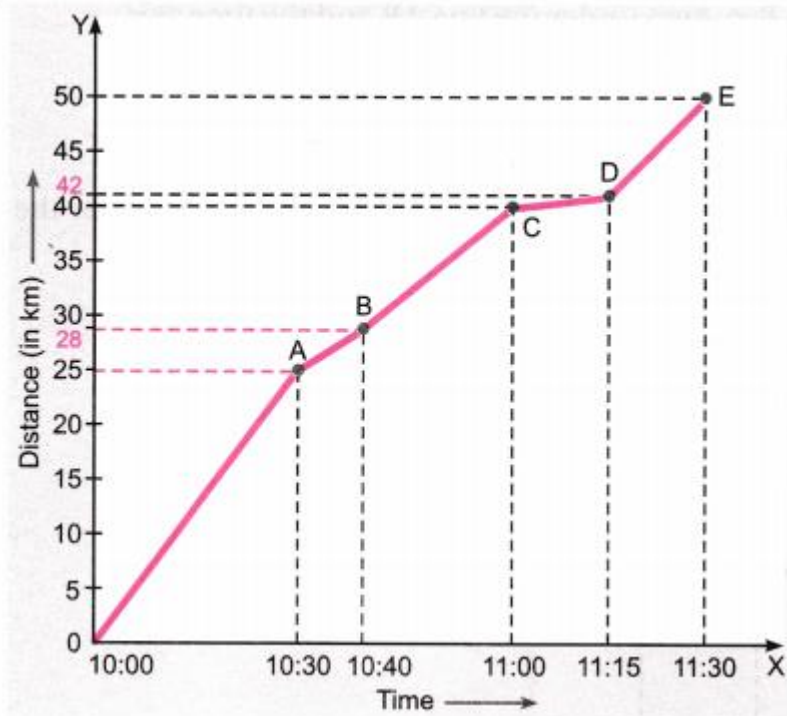
(iii) The reason is that the glass pane of the window is a hard solid. The flying pebble suffers change in momentum in a very short time, so the force exerted by the glass window on the pebble will be large. Consequently, the glass pane of the window will shatter.

(iv) The reason is that mass of the cricket ball is more than that of a tennis ball, Thus momentum is more in case of the cricket ball due to larger mass as compared to the tennis ball. So, less force has to be applied in the case of the tennis ball to stop.

(v) The reason is that when athletes are running for the throw, then due to inertia of motion they often fail to stop themselves before the line.

3.

(i)



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

In this problem, total distance travelled = 50 km.

Total time taken 10:00 AM to 11:30 AM

$$= 1 \text{ hour } 30 \text{ minutes} = 1 \frac{1}{2} \text{ h} = \frac{3}{2} \text{ h}$$

$$\therefore \text{ Now average speed} = \frac{50 \text{ km}}{\frac{3}{2} \text{ h}} = \frac{100}{3} \text{ km/h} = 33.33 \text{ kmh}^{-1}$$

(iii) We know that, speed = slope of distance-time graph. The greater the slope, the greater is the speed. From the graph, it is clear that slope of distance-time graph is maximum between 10:00am to 10:30 am, so the train was travelling at the highest speed during this interval of time.

(iv) The part CD of the graph has minimum slope, so the train had minimum speed between 11:00 am and 11:15 am. Thus, the train had slowed down between 40km and 42 km.

(v) Speed between 10:40am to 11:00 am

$$= \text{Distance/Time} = (40-28) \text{ km}/20 \text{ min} = 12\text{km}/20/60\text{h}$$

$$=36 \text{ km/h}$$

4. We know for upward motion, $v^2 = u^2 - 2 g h$ or $h = \frac{u^2 - v^2}{2g}$

But at highest point $v = 0$

Therefore, $h = \frac{u^2}{2g}$

For first ball, $h_1 = \frac{u_1^2}{2g}$

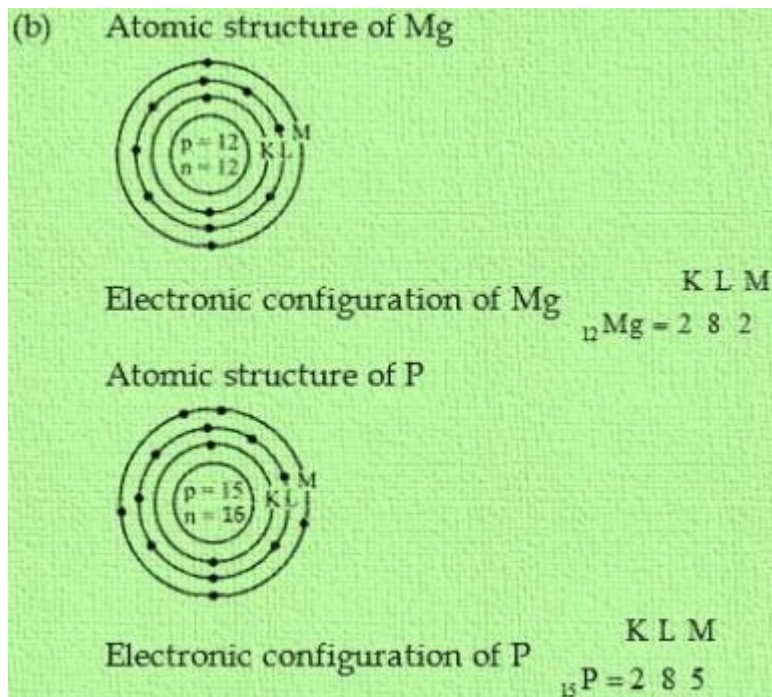
and for second ball, $h_2 = \frac{u_2^2}{2g}$

$$\text{Thus } \frac{h_1}{h_2} = \frac{\frac{u_1^2}{2g}}{\frac{u_2^2}{2g}} = \frac{u_1^2}{u_2^2} \text{ or } h_1 : h_2 = u_1^2 : u_2^2$$

5. (a) Different organisms whether unicellular or multicellular need to perform many functions such as respiration, digestion, locomotion etc. In multicellular organisms, cells present in a group and specialised in one particular function form a tissue. Some tissues help in growth, while others in locomotion and some in body movement. So, if cells are not organised in these tissues, then this kind of highly organised and specialised process will become disorganised. There will be no coordination in the functioning of the cells and body.

(b) When, the simple squamous epithelium is arranged in a pattern of multilayers to prevent wear and tear, the epithelium is called stratified squamous epithelium e.g. in skin.

6. (i) Octet is an arrangement of 8 electrons in outermost shell to achieve nearest noble gas electronic configuration. Elements complete their octet by sharing, gaining or donating electrons to become stable



7. (i) (a) As most of the α particles passed through the gold foil undeflected

(b) A few of the α particles which are positively charged, deflected due to the positive charge of nucleus.

(ii) (a) Number of neutrons = mass number - atomic number = $32 - 16 = 16$

(b) The electronic configuration of the element will be as follows :

K L M

2,8,6

Hence, the number of electrons in outermost shell is 6.

(iii) According to Rutherford's model of an atom, positively charged protons are present in the nucleus of an atom.