

**Class: IX**  
**Subject: Science**  
**Topic: OASK1509SA203**  
**No. of Questions: 41**

**Time: 3 hours**

**M.M.: 80**

**General Instructions:**

1. The question paper comprises of two sections, A and B, you are to attempt both the sections.
2. All questions are compulsory.
3. There is no overall choice. However, internal choice has been provided in all the three questions of five marks category. Only one option in such questions is to be attempted.
4. All questions of section A and all question of section B are to be attempted separately.
5. Question numbers 1 to 4 in section A are one mark question. These are to be answered in one word or one sentence.
6. Question numbers 5 to 13 are two marks questions, to be answered in about 30 words.
7. Question numbers 14 to 22 are three marks questions, to be answered in about 50 words.
8. Question numbers 23 to 25 are five marks questions, to be answered in about 70 marks.
9. Question numbers 26 to 41 in section B are multiple choice question are based on practical skills. Each question is a one mark question. You are to choose one most appropriate response out of the four provided to you.

**SECTION – A**

Q1. A blacksmith uses a heavy hammer and brings it from a height before striking on the chisel. Why?

Sol. So that hammer has higher amount of potential energy and hence more work can be done on the chisel.

Q2. Write the formula for kinetic energy of the object.

Sol. Kinetic energy =  $\frac{1}{2} mv^2$   
m = mass of object  
v = velocity of the object

Q3. Name the two gases that comprise about 99% parts of will thrive on that soil.

Sol. Nitrogen and oxygen.

Q4. Name any two parameters that decide which type of plants will thrive on that soil.

Sol. Parameters that decide the type of plants that will thrive in that soil are:

- (i) The nutrient content of the soil.
- (ii) The amount of humus present in the soil.
- (iii) The depth of the soil.

Q5. Explain the following:

- (a) Swimmers are provided with an inflated rubber jacket / tube. Why?
- (b) It is easier to swim in sea water than in river water. Why?

Sol. (a) Swimmers are provided with an inflated rubber jacket or rubber tube. The jacket tube has the low weight and large volume. Hence, it displaces large volume of water. As a result, up thrust due to water increases and the person remains floating i.e., there is no chance of drowning of the swimmer in such case.  
(b) It is easier to swim in sea water because density of sea water is more due to its salty nature. Hence, up thrust acting on the swimmer in sea water is more in case of sea water than in fresh water. So, it is easier in sea water.

Q6. In a car lift, a car of 1200 kg mass is resting on a platform of surface area 10 m<sup>2</sup>. What pressure should the platform exert on the car so as to lift it?

Sol. Mass of car  $m = 1200$  kg  
 $\therefore$  Weight of car  $= mg = 1200 \times 9.8 \text{ N} = 117600 \text{ N}$   
 $\therefore$  Force needed to lift the car  $F = mg = 117600 \text{ N}$  (upward)  
As area of platform  $A = 10 \text{ m}^2$   
 $\therefore$  Pressure  $P = \frac{F}{A} = \frac{117600}{10} = 11760 \text{ Pa}$

Q7. A person is listening to a tone of 500 Hz sitting at a distance of 450 m from the source of sound. What is the time interval between successive compressions from the source?

Sol. Here frequency of sound  $\nu = 500$  Hz.  
Time interval between successive compressions from the source –  
 $=$  Time period,  $T = \frac{1}{\nu} = \frac{1}{500} \text{ s} = 0.002 \text{ s}$

Q8. What are polyatomic ions? Give two examples.

Sol. Polyatomic ions are those ions that contain more than one atom. These atoms can be of the same type or different type.

Some examples of polyatomic ions are  $NO_3^-$ ,  $NH_4^+$ ,  $OH^-$ ,  $SO_4^{2-}$ , and  $SO_3^{2-}$

Q9. (a) Write the electronic configuration of the elements whose atomic numbers are 5 and 7.  
 (b) Why is an atom considered to be neutral

Sol. (a)

Atomic number	Electronic configuration			
	K	L	M	N
5	2	3		
7	2	5		

(b) Protons are positively charged while electrons are negatively charged particle of an atom. In an atom, the number of protons is equal to the number of electrons. Thus, an atom is neutral.

Q10. (a) Why do gymnosperms and angiosperms differ from each other?  
 (b) Name the largest phylum which is probably the largest group of animals?

Sol. (a) Difference between gymnosperm and angiosperm.

Angiosperm	Gymnosperm
(i) Seeds are enclosed inside fruit.	(i) Seeds are naked not enclosed by fruit.
(ii) Bear flowers.	(ii) Bear cones.

(b) Arthropoda.

- Q11. (a) List any two uses of ground water.  
(b) How ozone layer is useful to us?

Sol. (a) Ground water is used for :  
(i) Human consumption  
(ii) Irrigation  
(b) It absorbs harmful radiations such as UV rays from the sun which are injurious to human beings.

- Q12. (a) Name the factors which influence the patterns of winds.  
(b) Name any two greenhouse gases.

Sol. (a) The factors which influence the patterns of winds are:  
(i) The rotation of the earth.  
(ii) The presence of mountain ranges in the paths of the wind  
(b) Two greenhouse gases are carbon di oxide and methane.

- Q13. (a) What is advantage of using scientific name instead of common name?  
(b) Write any one point of difference between amphibians and aves.

Sol. (a) Common names of plants and animals differ from one country to other and from state to another in one country whereas the scientific name is universal, being used all over the world irrespective of the language of the people.  
(b) Amphibia - Cold – blooded animal having three – chambered heart.  
Aves – Warm – blooded animal having four – chambered heart

- Q14. (a) Distinguish between longitudinal and transverse wave. Give one example each.  
(b) Write two important applications of ultra sound waves.

Sol. (a)

Longitudinal Waves	Transverse Waves
<ol style="list-style-type: none"><li>1. Longitudinal waves are the waves in which medium particles vibrate in a straight line parallel to the direction of wave propagation.</li><li>2. In a longitudinal wave alternate compressions and rarefactions are formed. Example, Sound waves.</li></ol>	<ol style="list-style-type: none"><li>1. Transverse waves are the waves in which medium particles vibrate at right angles to the direction of wave propagation.</li><li>2. In a transverse wave alternate crests and troughs are formed. Example, light waves.</li></ol>

(b) Two important applications of ultrasound (or ultrasonic waves) are:

1. Ultrasound waves are used by doctors to detect abnormalities in certain human organs like detection of "Stone in gall bladder and kidney or detection of tumours in different human organs.
2. Ultrasound waves are used for thorough cleaning of objects like spiral tubes, odd shaped parts, electronic components etc.

- Q15. (a) Define potential energy and given few examples of objects possessing potential energy.  
(b) What is gravitational potential energy? How does the change in potential energy of an object between two given points depend?

Sol. (a) Potential energy possessed by an object is the energy present in it by virtue of position or configuration (i.e. size and shape) or change thereof. Water stored in a dam, a stretched or compressed spring, stretched bow and arrow, an object situated at a height possess potential energy.

(b) The gravitational potential energy of an object at a point above the ground is defined as the work done in raising it from the ground to that point against gravity. If an object of mass  $m$  is situated at a height  $h$  above the ground, then its gravitational potential energy is given by

$$E_p = mgh$$

Change in potential energy between two given points (or the work done for taking an object from one point to another point) simply depends on the difference in vertical heights of the initial and final positions of the objects and not on the path along which the object is moved.

- Q16. (a) A ship sends out ultrasound produced by transmitter that returns from the sea bed and detected after 3.42 s. If the speed of ultrasound waves through sea water is  $1530 \text{ s}^{-1}$ , What is the distance of the sea bed from the ship?  
(b) What is SONAR?

Sol. (a) ∴ Speed of ultrasound through sea water  $v = 1530 \text{ m s}^{-1}$

Time of echo  $t = 3.42 \text{ s}$

$$\begin{aligned} \text{Depth of sea bed } d &= \frac{vt}{2} \\ &= \frac{1530 \times 3.42}{2} \\ &= 2616.3 \text{ m} \end{aligned}$$

(b) SONAR stand for sound navigation and ranging. It is a device that uses ultrasonic waves to measure the distance, direction and speed of underwater objects.

- Q17. Valencies or charges of some ions are given below:

Hydrogen ion,  $\text{H}^+ = + 1$

Oxide ion,  $\text{O}^{2-} = - 2$

Aluminum ion,  $\text{Al}^{3+} = 3 +$

Nitride ion,  $\text{N}^{3-} = 3 -$

Calcium ion,  $\text{Ca}^{2+} = 2 +$

Hydroxide ion,  $\text{OH}^- = 1 -$

Sodium ion,  $\text{Na}^+ = + 1$

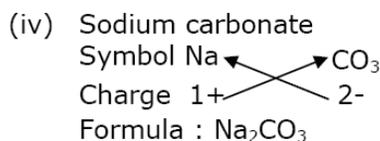
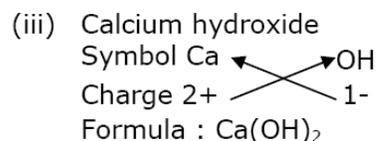
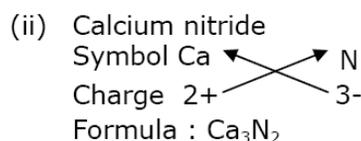
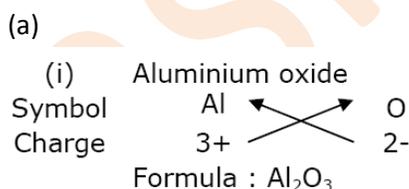
Carbonate ion,  $\text{CO}_3^{2-} = 2 -$

Using the above information, write down the chemical formulae of the following:

- (i) Aluminum oxide  
(ii) Calcium nitride  
(iii) Calcium hydroxide  
(iv) Sodium carbonate

(b) Why is it not possible to see an atom with naked eyes?

Sol.



(b) The dimension of atoms is very small of the order of  $10^{-10} \text{ m}$  to  $10^{-9} \text{ m}$ . Thus, we cannot see an atom with naked eyes.

Q18. Calculate the number of molecules of sulphur ( $S_8$ ) present in 16 g of solid sulphur. (Given : Atomic mass of S = 16)

Sol. Gram atomic mass of sulphur atom = 16 g  
Gram molecular mass of sulphur molecule =  $8 \times$  Gram atomic mass of sulphur atom  
 $= 8 \times 16$   
 $= 256$  g

256 g of sulphur molecule contains one mole of sulphur molecules

256 g of sulphur molecule contains  $6.022 \times 10^{23}$  sulphur molecules

Thus, 16g of sulphur molecule will contain  $= \frac{1}{256} \times 6.022 \times 10^{23} \times 16$   
 $= 3.76 \times 10^{22}$  sulphur molecules

Number of molecules of sulphur present in 16g of solid sulphur is  $3.76 \times 10^{22}$

Q19. (a) How physicians are able to pinpoint a particular disease?  
(b) What is the main difference between communicable and non – communicable diseases?

Sol. (a)  
(i) First, physicians will look for signs of disease on the basics of symptoms. These signs will give a little more definite indication of the presence of a particular disease.  
(ii) Physicians will also get laboratory tests done such as blood test, urine test etc., to pinpoint the disease further.

(b) Communicable diseases are the diseases that spread from the infected person to the healthy and are caused by some pathogen.

Non – communicable disease remains confined to the diseased person and do not spread to others.

Q20. (a) Give suitable terms for the following:  
(i) Animals carrying the infecting agents from a sick person to another potential host.  
(ii) Preventive inoculation against a disease.

(b) Write the full form of AIDS. Name the virus that caused AIDS.

Sol. (a)  
(i) Vector  
(ii) Vaccination

(b) AIDS – Acquired Immuno Deficiency Syndrome.  
Human Immuno deficiency virus

- Q21. (a) What is the binomial system of nomenclature?  
(b) Mention any two characteristics feature of phylum Echinodermata?

Sol. (a) Each and every organism is given a biological name, which consist of two components, one is genus name and second is species name.

For example, the scientific name of man is “Homo Sapiens”, where the genus name of man is Home and the specific name is sapiens.

(b)

- (i) Body is unsegmented and is covered by calcareous spines  
(ii) Sexes are separate.

- Q22. (a) Under which of the following conditions is a person most likely to fall sick?  
(i) When she is recovering from malaria.  
(ii) When she has recovered from malaria and is taking care of someone suffering from chicken pox.  
(iii) When she is on a four – day fast after recovering from malaria and is taking care of someone suffering from chicken – pox. Why?  
(b) Name any two infectious diseases against which vaccine is available.

Sol. (a) Person is most likely to fall sick under condition mentioned at (iii).

Reason:

After recovering from malaria she is on a four day fast. Fasting weakens the body immune system and she is likely to get chicken pox as chicken pox is a contagious disease which spreads through direct contact with the patient.

(b) Tetanus, Diptheria, Whooping cough, Measles, Polio

- Q23. (a) What is the amount of work done:  
(i) By an electron revolving in a circular orbit of radius  $r$  round a nucleus?  
(ii) By an electron moving with half the speed of light in empty space free of all forces?

(b) An electric pump is used to pump water from an underground sump to the overhead tank situated 20 m above. It transfers 2000 kg of water to overhead tank in 15 minutes. Calculate the power of pump.

(c) What do you mean by instantaneous power of a device?

Sol. (a)  
(i) Here a centripetal force provided by electrostatic force of attraction acts on the electron towards the centre of orbit but motion is along the tangent to the circular orbit at each point. As force and displacement are in mutually perpendicular directions at each point, the work done is zero.

(ii) Here, no force of any sort is acting on the electron, so the work done is zero.

(b) Here height of overhead tank  $h = 20$  m,  
Mass of water to be raised  $m = 2000$  kg  
and time  $t = 15$  minutes  $= 15 \times 60$  s  $= 900$  s

$$\begin{aligned}\therefore \text{Power of pump} &= \frac{\text{Total work}}{\text{Total time}} \\ &= \frac{mgh}{t} = \frac{2000 \times 9.8 \times 20}{900} = 435.5 \text{ W}\end{aligned}$$

(c) The instantaneous power of a device at a particular instant of time is defined as the rate of doing work by the device at that very instant.

**OR**

- (a) Certain force acting on a 20 kg mass changes its velocity from 5 m/s to 2 m/s. Calculate the work done by the force.  
(b) State two possible conditions under which the work done would be zero.  
(c) If the kinetic energy of the body is increased by 300% then determine the percentage increase in the momentum.

Sol. (a) Mass of an object  $m = 20$  kg,  
Initial velocity  $u = 5$  m/s  
and final velocity  $v = 2$  m/s  
 $\therefore$  Initial kinetic energy of object  $E_1 = \frac{1}{2} mu^2$   
 $= \frac{1}{2} \times 20 \times (5)^2 = 250 \text{ J}$

And final kinetic energy of object  $E_2 = \frac{1}{2} mv^2$   
 $= \frac{1}{2} \times 20 \times (2)^2 = 40 \text{ J}$

$\therefore$  Loss in kinetic energy  $= E_1 - E_2 = 250 - 40 = 210 \text{ J}$

Work done by the force  $W = \text{Change in kinetic energy} = -210 \text{ J}$

The negative sign of work shows that there is decrease in kinetic energy of the mass.

- (b)  
(i) There is no net force applied to the object.  
(ii) Force is being applied but it does not cause any displacement.

(iii) Force is being applied and the object suffers displacement too but angle between the force and displacement is  $90^\circ$

(c) Given,

$$\frac{\Delta E}{E_1} = 300\%$$

$$i. e., \frac{E_2 - E_1}{E_1} = \frac{300}{100} = 3$$

To determine

$$\frac{P_2 - P_1}{P_1} \%$$

$$\frac{P_2 - P_1}{P_1} = \frac{\sqrt{2mE_2} - \sqrt{2mE_1}}{\sqrt{2mE_1}}$$

$$= \frac{\sqrt{E_2} - \sqrt{E_1}}{\sqrt{E_1}} = \sqrt{\frac{E_2}{E_1}} - 1$$

$$\frac{E_2}{E_1} - 1 = 3$$

$$\frac{E_2}{E_1} = 3 + 1 = 4$$

$$\frac{P_2 - P_1}{P_1} = \sqrt{4} - 1 = 2 - 1 = 1$$

$$\frac{P_2 - P_1}{P_1} \% = 100\%$$

- Q24. (a) How is the valency of an atom related to its electronic configuration?  
(b) Composition of the nuclei of two atomic species A and B is given as under:

A	B
Protons = 6	Protons = 6
Neutrons = 6	Neutrons = 8

Calculate the mass numbers of A and B. What is the relation between the two species and which element or elements do they represent?

Sol. (a) Valency is the combining capacity of an atom. Valency is calculated by using the number of valence electrons in an atom. The numbers of electrons which are present in the last shell of an atom and take part in chemical bond formation are known as valence electrons. The number of electrons which an atom has in its last orbit can be found out by writing the electronic configuration of the atom.

So, electronic configuration express the valence electrons which are related to the valency of the atom.

(b) Mass number = Number of protons + Number of neutrons

$$\therefore \text{Mass number of A} = 6 + 6 = 12$$

$$\text{Mass number of B} = 6 + 8 = 14$$

The two atomic species have the same number of protons but different number of neutrons. In other words, the two species have the same atomic number but different mass numbers.

Such atoms are called isotopes.

The atoms A and B represent the same element carbon with atomic number 6.

OR

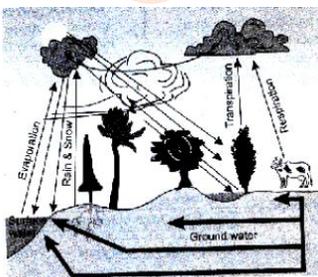
- (a) Why is helium inert?
- (b) Why Na atom gets 1 + charge when it loses one electron?
- (c) What are the limitations of Rutherford's model of the atom?
- (d) Name the particles which determine the mass of an atom.

- Sol.
- (a) The atomic number of helium is 2. It has two electrons in the first shell or K shell. It is its outermost shell and has maximum capacity of 2 electrons. So, the outermost shell of the atom is completely filled. Hence, helium atom is inert.
  - (b) Atomic number of Na is 11, so one atom of Na contains 11 protons and 11 electrons which means 11 units positive charge and 11 units negative charge. Hence, it does not have any net charge. When one electron is lost, negative charge becomes 10 units and positive charge is 11 units, So, Na gets one positive charge.
  - (c) As we know, when charged bodies move in circular motion, they emit radiations. This means that the electrons revolving round the nucleus (as suggested by Rutherford) would finally merge into the nucleus. This makes the atom unstable, which is clearly not the case.
  - (d) The mass of an atom is determined by the number of protons and neutrons. Atomic mass = Number of neutrons + Number of protons.

- Q25.
- (a) Define water cycle.
  - (b) Draw water cycle in nature giving neat and labeled diagram
  - (c)
    - (i) What is nitrogen fixation?
    - (ii) What is the effect of oxygen on nitrogen?

Sol. (a) Water cycle is the movement of water from water bodies to atmosphere, precipitation and flow of water bodies.

(b)



- (c) (i) Nitrogen fixation is the process of conversion of atmospheric nitrogen into nitrates.  
(ii) Nitrogen fixation cannot take place in the presence of oxygen.

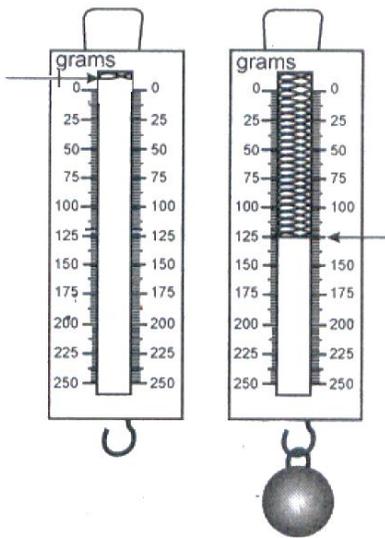
OR

- (a) Define soil pollution.  
(b) Name any two methods to prevent the loss of top soil.  
(c) How is acid rain formed?

- Sol. (a) Soil pollution : Removal of useful components from the soil and addition of other substances, which adversely affect the fertility of the soil and kill the diversity of organism that live in it is called soil pollution.  
(b) Loss of top soil can be prevented by :  
(i) Increasing the vegetation cover.  
(ii) By preventing excessive grazing by animals  
(iii) Checking the falling of trees.  
(c) Most of the vehicles on the road and industries emit out gases like oxides of nitrogen and sulphur. During rains, these compounds get dissolved in water to make sulphuric acid and nitric acid. The falling of rain with acidic water is called acid rain.

SECTION – B

- Q26. The spring balance shown here is used to measure that mass of a given solid.



The actual mass of the solid is:

- (a) = 125 g
- (b) < 125 g
- (c) > 125 g
- (d) Faulty balance, hence cannot estimate.

Sol. (b)

Q27. The measuring range of a measuring cylinder is 25 ml. If its least count is  $\frac{1}{2}$  ml, then the space between 5 ml mark and 10 ml mark should be divided into

- (a) 25 equal parts
- (b) 10 equal parts
- (c) 5 equal parts
- (d) 2 equal parts

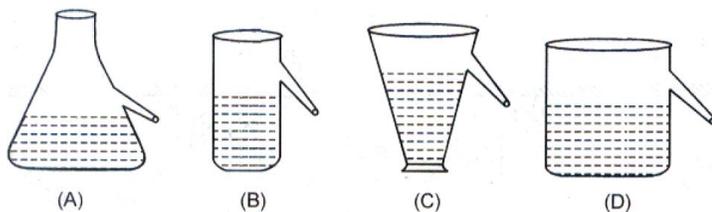
Sol. (b)

Q28. If we want to determine the volume of a solid by immersing it in water, the solid should be

- (a) Lighter than water
- (b) Heavier than water
- (c) Insoluble in water
- (d) Heavier than water and insoluble in it.

Sol. (d)

Q29. Four students A, H, C and D while performing an experiment on establishing the relation between the loss of weight of a small solid when fully immersed in tap water, and the weight of water displaced by it, used four different shapes of overflow cans containing water as shown.



The arrangement, that would give correct result, is that of student:

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

Sol. (b)

Q30. In which of the following medium will the sound waves travel faster?

- (a) Air
- (b) Vacuum of
- (c) Water
- (d) Steel

Sol. (d)

Q31. For a given applied thrust, pressure exerted on a surface by a sharp pin is

- (a) More than the pressure exerted by a blunt pin.
- (b) Less than the pressure exerted by a blunt pin.
- (c) Equal to the pressure exerted by a blunt pin.
- (d) Either less or equal to the pressure exerted by a blunt pin.

Sol. (a)

Q32. In an experiment to observe and compare the pressure exerted by a solid on sand, a student placed the iron cuboid on sand in three different manners in contact with sand as  $A_1$ ,  $A_2$ , and  $A_3$  respectively. If the corresponding depress observed by him were  $d_1$ ,  $d_2$  and  $d_3$ , then

(a) $d_1 : d_2 : d_3 = A_1 : A_2 : A_3$	(b) $d_1 = d_2 = d_3$
(c) $d_1 : d_2 : d_3 = \frac{1}{A_1} : \frac{1}{A_2} : \frac{1}{A_3}$	(d) $\frac{d_1}{A_1} + \frac{d_2}{A_2} + \frac{d_3}{A_3} = \text{a constant}$

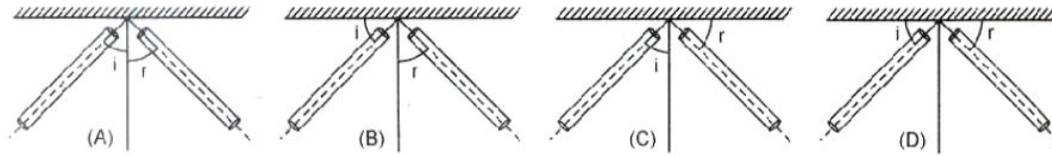
Sol. (c)

Q33. In the experiment of verifying the law of reflection of sound the clock should be placed just at the edge of tubes so that:

- (a) Only sound passing through tube no. 1 and reflected from wall comes through tube no. 2 is received.
- (b) Tubes may transmit sound.
- (c) Disturbance due to wind is avoided.
- (d) Sound produced by clock becomes a musical sound.

Sol. (a)

- Q34. While doing expression on verifying the law of reflection of sound, four students measured the angles  $\angle i$  and  $\angle r$  as shown in the diagram below. The correct measurement of the angle of incidence and angle of reflection has been done by student.



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

Sol. (a)

- Q35. Four students did their experiment on measuring the speed of a pulse through a string as follows:  
Students A stretched his thick cotton string very taut and give it a very mild transverse horizontal jerk.  
Students B stretched his thin jute string just taut and gave it a mild transverse horizontal jerk.  
Student C stretched his thick cotton string just taut and gave it a strong transverse horizontal jerk.  
Student D stretched his thin jute string very taut and gave it a strong transverse horizontal jerk.  
The best choice is that of student

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

Sol. (c)

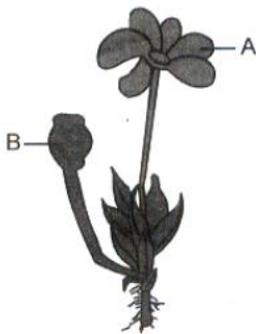
Q36. The given figure is that of :



- (a) Ulothrix
- (b) Spirogyra
- (c) Chlamydomonas
- (d) Cladophora

Sol. (b)

Q37. A student carefully observes the parts labeled 'A' and 'B' in the given diagram and classifies the plant correctly as:



- (a) A bryophyte
- (b) A pteridophyte

- (c) A gymnosperm
- (d) An angiosperm

Sol. (d)

Q38. Rudra, Rehman, Shweta and Parol were given a specimen of fern for recognizing the main characters of pteridophyta. Each one wrote four characters in favour of answer. Who gave the right answer?

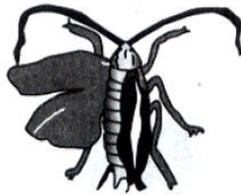
Name of student	Root	Stem	Leaf	Reproductive organ
(a) Rudra	Adventitious	Rhizome	Impertipinnate compound leaf	In sori
(b) Rehman	Tap roots	Corm	Pertipinnate compound leaf	In capsule
(c) Shweta	Fibrous roots	Bulb	Simple leaf	Embedded in leaf
(d) Parol	Contractile roots	Tuberous	Sessile leaf	No organ

Sol. (a)

Q39. Which animal belongs to phylum Arthropoda?



(A)



(B)



(C)



(D)

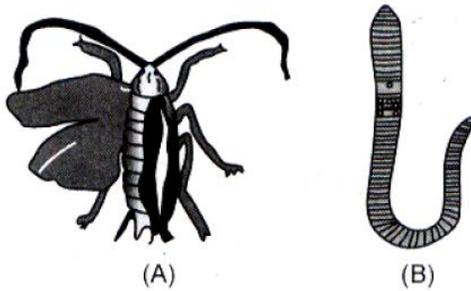
- (a) A
- (b) B
- (c) C
- (d) D

Sol. (b)

- Q40. A specimen of a fish was given to students to identify the externally visible chordate feature in it. The student would look for
- (a) Operculum
  - (b) Notochord
  - (c) Dorsal tubular nerve cord
  - (d) Post anal tail

Sol. (d)

- Q41. Given below are picture of two animals A and B belonging to two different phyla. Which characteristic features of their bodies are specific feature of their respective phylum?



- (a) Antennae of A and segments of B.
- (b) Three pairs of appendages of A and clitellum of B.
- (c) Jointed appendages of A and segmented body of B without appendages.
- (d) Wings of A and slender body of B.

Sol. (a)