

Time: 3 Hours

M.M.: 80

General Instructions

- i) The question paper comprises of two sections, A and B, you are to attempt both the sections.
- ii) All questions are compulsory.
- iii) 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.
- iv) All questions of section A and all questions of section B are to be attempted separately.
- v) Question numbers 1 to 4 in section A are one mark question. These are to be answered in one word or one sentence.
- vi) Questions numbers 5 to 13 are two marks questions, to be answered in about 30 words.
- vii) Question numbers 14 to 22 are three marks questions, to be answered in about 50 words.
- viii) Question numbers 23 to 25 are five marks questions, to be answered in about 70 marks.
- ix) Question numbers 26 to 41 in section B are multiple choice questions 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

1. Is potential energy a vector or a scalar quantity?
2. At what position, pendulum acquires the maximum kinetic energy?
3. Write any two methods of preventing soil erosion.
4. Why the temperature of the moon falls to -190°C ?
5. (i) On the basis of Thomson's model of an atom, explain how the atom is neutral as a whole?
(ii) Where are electrons found in the atom?
6. (i) Which postulate of Dalton's atomic theory is the result of the law of conservation of mass?
(ii) Name the term used for the symbolic representation of a molecule of an element or a compound? Give an example of it.

7. (a) Which phylum of kingdom animalia has spiny body? Give one example of it.
(b) Write the name of the class to which the following belongs:
(i) Sea horse.
(ii) King cobra.
8. (a) Write two points of difference between amphibians and reptiles.
(b) List two characters which help amphibians to survive on land.
9. (i) Do fluids exert pressure? How is pressure transmitted in a fluid?
(ii) Why a steel ball sinks in water?
10. Relative density of silver is 10.8. The density of water is 10^3 Kgm^{-3} . What is the density of silver in SI unit?
11. (i) Give any two examples of longitudinal waves.
(ii) What is the most essential property of a wave motion and why?
12. (a) What is the major component of atmosphere of earth and Venus?
(b) What is the direction of air in coastal areas during the night?
13. (a) Name any two abiotic factors that make soil.
(b) What would happen if all the oxygen present in the environment is converted to ozone?
14. (a) What are lichens? Give two examples and one use of it?
(b) Name the excretory organs of following:
i. Cockroach
ii. Leech
15. (a) What are the two ways to treat an infectious disease?
(b) Name any two sexually transmitted diseases.
16. (a) How air borne transmitted diseases like common cold spreads?
(b) What do we call such microorganisms that cause diseases? Give one example also.
17. (a) Why antibiotics do not work against viruses?
(b)
i. Name any two diseases which have long term effect on the health of an individual.
ii. What is immunity?
18. (a) What is the mass of:
(i) 0.2 mole of oxygen atoms?
(ii) 0.5 mole of water molecules?
(b) Name the two types of radicals.
19. (a) State the law of constant proportions? Explain with one example.
(b) Write the symbols of sodium and silver.

20. (a) Calculate the work done in lifting 200 kg of water through a vertical height 6 meter. (Assuming $g = 10\text{m/s}^2$)
(b) When an object moves on a circular path, what is the work done?
21. (a) Define frequency and wavelength in reference to sound.
(b) What is echo? Give formula for time of echo.
- 22.(a) Establish a relation between wavelength, frequency and speed of sound in a medium.
(b) Give two examples of transverse waves.
23. (a) Describe the oxygen cycle in nature.
(b) What is the importance of carbon cycle in nature?
(c) List any two consequences of global warming.

Or

- (a) Define biogeochemical cycles.
(b) Describe the various steps of hydrological cycle.
(c) How is acid rain formed?

24. The atomic number of chlorine is 17 and mass number is 35.
a. What would be the electronic configuration of a negatively charged chloride ion, Cl^- ?
b. What would be the atomic number and mass number of Cl^- ?
c. Define valency and calculate the valency of Cl^- .

OR

The relative atomic mass of Boron is 10.8. Calculate the percentage of its isotopes $^{10}_5\text{B}$ and $^{11}_5\text{B}$, occurring in nature.

- 25.(a) Calculate the power of an engine which can lift 200 Kg of water to store in a tank at a height of 10 m in 4.9 s. Also express in horse power. (given $g = 9.8\text{ m/s}^2$).
(b) What type of energy is stored in the spring of a watch?
(c) What is the work done by the tension in the string of a sample pendulum?

Or

- (a) What happens to the kinetic energy when:
(i) The mass of the body is doubled at constant velocity?
(ii) The velocity of the body is doubled at constant mass?
(iii) The mass of the body is doubled but the velocity is reduced to half?
(b) Two bodies of equal masses move with the uniform velocities v and $3v$ respectively. Find the ratio of their kinetic energies.

26. What type of surface is needed for the reflection of sound waves?
(a) Smooth surface only. (b) Polished and smooth surface.
(c) Hard surface only. (d) Polished and rough surface.

27. SI unit of pressure is
(a) Newton (b) Newton m²
(c) Newton/m² (d) Pascal m²

28. 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 and 10 ml mark should be divided into
(a) 25 equal parts
(b) 10 equal parts
(c) 5 equal parts
(d) 2 equal parts

29. The sea water is denser than fresh water due to
(a) Evaporation (b) Mixing of sand
(c) Mixing of salts (d) Stagnation

30. Apparent loss in weight is caused due to
(a) Decrease in mass. (b) Decrease in volume.
(c) Upward thrust exerted by the liquid. (d) Decrease in density.

31. A nail sinks in the sea water but a much heavier ship floats on it because
(a) Density of sea water is very high.
(b) Ship is not too heavy.
(c) The weight of the water displaced by the ship is more than that of the ship.
(d) The uplift acting on ship is very small compared to the weight of the ship.

32. A body is weighed using a spring balance. It will show the weight of the body at your place to be
(a) More than at the equator.
(b) Equal to that at the poles.
(c) Less than that at the equator.
(d) More than that at the poles.

33. Waves propagate well in
(a) Loaded slinky (b) Unloaded slinky
(c) Equally in (a) and (b) (d) None of these.

34. A sound wave strikes the surface of reflecting body at an angle of 30°. The angle of incidence for the sound wave is
(a) 30° (b) 60°
(c) 120° (d) 90°

osbinbse.com 35. When a boy shouts in front of a high hall, he hears his own voice after some time. This phenomena is known as

- (a) Irregular reflection of sound.
- (b) An echo
- (c) Refraction of sound
- (d) A pulse formed in the air.

36. Which of the following is the characteristic feature of ferns?

- (a) They have male and female cones.
- (b) They have rhizoids.
- (c) They have needle shaped leaves.
- (d) Their plant body is differentiated into root, stem and leaves.

37. Choose the option which includes the feature that helps the fish to change its direction.

- (a) Caudal fin and pelvic fin
- (b) Dorsal fin and anal fin.
- (c) Dorsal fin only
- (d) Caudal fin only

38. Pick the odd one out:

- (a) Jointed legs
- (b) Scales
- (c) Compound eyes
- (d) Wings

39. Which of the following is not an aerial adaptation of bird?

- (a) Presence of strong flight muscles.
- (b) Presence of vertebral column.
- (c) Streamlined body.
- (d) Forelimbs modified into wings.

40. Choose the option that best describes the feature of spirogyra.

- (a) Multicellular, autotrophic, root like rhizoids
- (b) Cytoplasmic strands, autotrophic, presence of rhizome
- (c) Presence of male cones, nonvascular filaments
- (d) Filamentous, Presence of cytoplasmic strands, presence of pyrenoids

41. Identify the group of plants in which vascular tissues are present, but no seeds,

- (a) Bryophyta
- (b) Pteridophyta
- (c) Gymnosperm
- (d) Angiosperm

1. Potential energy is a scalar quantity. 1
2. A swinging pendulum acquires maximum kinetic energy at its mean position. 1
3. a. Grazing of animals should be prevented. $\frac{1}{2}$
b. Prevention of deforestation and increase of forestation. $\frac{1}{2}$
4. Because there is no atmosphere on the moon. 1
5. (i) According to Thomson's model, an atom is made up of positively charged sphere in which electrons are embedded. The negative and positive charges are equal in magnitude. An atom has the same number of electrons and protons. This explains that the atom is neutral as a whole. 1
(ii) Electrons revolve around the nucleus in certain fixed paths which are called orbits or shells having definite energy. 1
6. (i) "Atoms are indivisible particles which can neither be created nor destroyed in a chemical reaction". 1
(ii) Chemical formula. $\frac{1}{2}$
Example – Chemical formula of sodium carbonate is Na_2CO_3 . $\frac{1}{2}$
7. (a) The animals of phylum Echinodermata have spiny skinned body. $\frac{1}{2}$
Example – Asterias (star fish), Holothuria (Sea cucumber)
(Any one; $\frac{1}{2}$)
- (b) (i) Sea horse – Pisces. $\frac{1}{2}$
(ii) King cobra – Reptilia. $\frac{1}{2}$

8. (a)

Amphibians	Reptiles
i. Body has no scales.	i. Body is covered with scales.
ii. Respiration is by gills or lungs.	ii. Respiration is by lungs only.

 $\frac{1}{2} \times 2 = 1$

(b) The two characters are:

- i. They have two pairs of pentadactyl limbs. $\frac{1}{2}$
- ii. They respire through lungs on land. $\frac{1}{2}$

9. (i) Fluids too have weight and as a result, they also exert pressure
 In a confined mass of fluid, pressure applied on the fluid in any particular direction is transmitted undiminished (or equally) in all directions. 1
- (ii) A steel ball sinks in water because the weight of the steel ball is greater than the buoyant force acting on it due to water. 1

10. Relative density of silver = 10.8 1/2
 Relative density of water = 10^3 Kgm^{-3} 1/2
 Density of silver in SI unit = Relative density of silver x Relative density of water
 $= 10.8 \times 10^3 \text{ Kgm}^{-3}$ 1

11. (a) i. Waves produced in air. 1/2
 ii. When a freely suspended spring is pulled downwards and released, longitudinal waves are produced. 1/2
 (b) The most essential property of a wave motion is its frequency. Frequency of a wave is its inherent characteristic and does not change by the change in temperature, pressure or change in medium. 1

12. (a) The major component of atmosphere of Earth is nitrogen (78%) and that of Venus is carbon dioxide(95-97%) 1
 (b) During night the direction of air current or wind is from land to sea. 1

13. (a)
 i. Sun
 ii. Water
 iii. Wind

Any two; $\frac{1}{2} \times 2 = 1$

- (ii) If all the oxygen present in the environment is converted to ozone then it would be difficult to breathe and survive and all the living forms would be killed. 1

14. (a) Lichens are a symbiotic combination between algae and fungi where both are mutually benefited. 1

It is used as pollution indicators. 1

- (b)
 i. Cockroach – Malpighian tubules 1/2
 ii. Leech- Nephridia 1/2

- 5.
- (a) The two ways to treat an infectious disease are:
- (i) To reduce the effects of the disease. 1
 - (ii) To kill the cause of the disease. 1
- (b) Syphilis and AIDS. $\frac{1}{2}$, $\frac{1}{2}$

16.

- (a) Air borne diseases occur through the little droplets thrown out by an infected person who sneezes or coughs. $\frac{1}{2}$

Someone standing closely can breathe in these droplets, and the microbes get a chance to start a new infection. $\frac{1}{2}$

(b) Pathogens 1

Example – bacteria, fungi, virus, protozoan (Any one; 1)

17.

- (a) Viruses have different cell pathways as compared to bacteria. Thus, they cannot be killed by antibiotics. $\frac{1}{2}$

Viruses have few biochemical mechanisms of their own. They enter the host cell and use their machinery for their life processes. $\frac{1}{2}$

If we have to reduce the severity of the disease then we have to work against our body or the host cell.

(b)

- i. Diabetes and AIDS. $\frac{1}{2}$, $\frac{1}{2}$
- ii. The built in resistance of body for a disease is called immunity. 1

18. (a)(i) Mass = Number of moles x Atomic mass $\frac{1}{2}$

$$\therefore \text{Mass of oxygen atoms} = 0.2 \times 16 = 3.2 \text{ g} \quad \frac{1}{2}$$

- (ii) Mass of water molecules = Number of moles x Molar mass of water (H_2O)

$\frac{1}{2}$

$$= 0.5 \times (2 \times 1 + 16) = 0.5 \times 18 = 9.0 \text{ g} \quad \frac{1}{2}$$

(b) There are two type radicals:

- (i) Cations or positively charged radicals. $\frac{1}{2}$

- (ii) Anions or negatively charged radicals. $\frac{1}{2}$

19. (a) Law of constant proportions: In a chemical substance, the elements are always present in definite proportions by mass. 1

For example, in a compound such as water, the ratio of the mass of hydrogen to the mass of oxygen is always 1:8, whatever the source of water. Thus, if 9 g of water is decomposed, 1 g of hydrogen and 8 g of oxygen are always obtained. 1

(b) The symbol of sodium is Na and the symbol of silver is Ag. $1/2 + 1/2$

20. (a) Given, mass of water (m) = 200 kg $1/2$

Height (h) = 6 m $1/2$

∴ weight of water (mg) = 200 × 10 N $1/2$

∴ work done = mg × h = 200 × 10 × 6 J = 12000 J $1/2$

(b) Work done is zero, because displacement is perpendicular to direction of force always. 1

21. (a) Frequency of sound is defined as the number of complete oscillations made per unit time by the oscillating body producing sound. Alternately, frequency of sound is defined as number of sound waves completed per unit time. 1

Wavelength of sound is the distance between centres of two consecutive compressions or centers of two consecutive rarefactions. 1

(b) When we stand some distance from a huge building or a cliff and speak loudly, we are able to listen our voice again after a definite interval of time due to reflection of sound wave from that building or cliff etc. Such repetition of sound due to reflection is known as 'echo'. If a reflecting object is situated at a distance d, the time of echo is

$$t = \frac{2d}{v}, \text{ where } v \text{ is the speed of sound.} \quad 1$$

22. (a) The speed of sound is defined as the distance which a point on a wave, such as compression or a rarefaction, travels per unit time. $1/2$

As distance covered by wave in one time period is called the wavelength, hence

$$\text{Speed of sound } v = \frac{\text{Distance covered in one vibration}}{\text{Time taken to complete one vibration}} = \frac{\lambda}{T} \quad 1/2$$

But $\frac{1}{T}$ = number of vibrations completed per unit time = ν = frequency

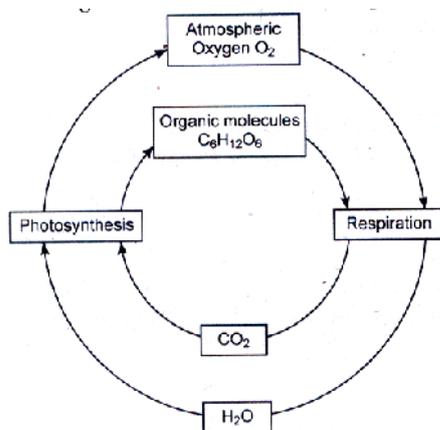
$$\therefore \nu = \lambda \times \frac{1}{T} = \lambda \nu \quad \frac{1}{2}$$

Or Speed of sound (ν) = frequency (ν) \times wavelength (λ) 1/2

(b) (i) Waves produce on the surface of water by dropping a stone. 1/2

(ii) Waves produce by plucking the string of a sitar. 1/2

23. (a) Oxygen-cycle: Oxygen from the atmosphere is used up in combustion, respiration and in the formation of oxides of nitrogen. It is returned to the atmosphere through photosynthesis.



(b) Carbon cycle helps to maintain constant level of carbon dioxide in the earth's atmosphere. 2
1

(c) Consequences of global warming:

- i. Changes in the amount and pattern of precipitation.
- ii. Melting of polar ice and rising sea level.
- iii. Extreme weather conditions like floods, droughts, heat waves, hurricanes and tornadoes etc.

Any 2; 1x2=2

Or

- (a) A biogeochemical cycle is the flow of matter from non-living environment to living organism and its return back to non-living environment. 1
- (b) The various steps of hydrological cycle are:
- Evaporation of water from the oceans and land. $\frac{1}{2}$
 - Condensation is transformation of water vapour into liquid water droplets in the air forming clouds. $\frac{1}{2}$
 - Precipitation over the ocean and land. $\frac{1}{2}$
 - Flow of water from land to the oceans. $\frac{1}{2}$
- (c) When fossil fuels are burnt to produce energy, the sulphur that is present in the fuel combines with oxygen to form sulphur dioxide and some of the nitrogen in the air forms nitrogen oxide. 1
These oxides dissolve in rainwater to form sulphuric acid and nitric acid, which reach the earth as acid rains. 1

24. a. Chlorine atom (Cl) has atomic number of 17. It contains 17 protons and 17 electrons.

Chloride ion (Cl^-) is formed when Cl gains one electron.

So, Cl^- has 18 electrons and 17 protons.

Therefore, the electronic configuration of $\text{Cl}^- = 2, 8, 8$ 1

b. Atomic number of $\text{Cl}^- = \text{Number of protons} = 17$ 1

Mass number of Cl^- will be the same as Cl i.e. 35 1

c. Valency is defined as the combining capacity of an atom.

For a non metallic element, it is equal to eight minus the number of electrons present in the outermost shell. 1

Here, Cl^- has 8 electrons in the outermost shell, therefore valency of $\text{Cl}^- = 8 - 8 = 0$

OR

Let the percentage of $^{10}_5\text{B}$ be y in the sample. $\frac{1}{2}$

The percentage of $^{11}_5\text{B}$ will be $(100 - y)$ $\frac{1}{2}$

Average Mass

$$= \left(10 \times \frac{y}{100} \right) + \frac{11 \times (100 - y)}{100} = 10.8 \quad 1$$

$$10y + 11(100 - y) = 10.8 \times 100$$

$$10y + 1100 - 11y = 1080$$

(1 Mark for calculations)

$$y = 20$$

Therefore, the percentage of $^{10}_5\text{B} = 20\%$ 1

And percentage of $^{11}_5\text{B} = 100 - 20 = 80\%$ 1

25. (a) Mass of water (m) = 200 kg

Height (h) = 10 m

Time (t) = 4.9 s

In lifting water, the engine works against gravity.

So, work done (W) = m x g x h 1/2

$$= 200 \text{ kg} \times 9.8 \text{ m/s}^2 \times 10 \text{ m} \quad 1/2$$

$$\text{Power} = \frac{\text{Work done}}{\text{Time}} \quad 1/2$$

$$= \frac{200 \times 9.8 \times 10 \text{ J}}{4.9 \text{ s}} \quad 1/2$$

$$= 4000 \text{ W} = \frac{4000}{746} \text{ HP} = 5.36 \text{ HP}. \quad 1/2$$

(b) Elastic potential energy. 1

(c) Tension acts perpendicular to the displacement of the simple pendulum hence work done is zero. 1

Or

(a) (i) The kinetic energy of a body of mass m and moving with velocity v is given by the expression $K = \frac{1}{2} mv^2$

Here $m = 2m$ and $v = v$, therefore final kinetic energy of the body will be $K.E. = \frac{1}{2} mv^2 = 2K$ i.e. the kinetic energy gets doubled. 1

(ii) Here $m = m$ and $v = 2v$, therefore final kinetic energy of the body will be

$K.E. = \frac{1}{2} m (2v)^2 = 4K$ i.e. the kinetic energy becomes four times the original. 1

(iii) Here $m = 2m$ and $v = v/2$, therefore final kinetic energy of the body will be

$K.E. = \frac{1}{2} 2m (v/2)^2 = K/2$ i.e. the kinetic energy becomes half. 1

(b) Let the mass of each body, be m. Then, KE of the first body, $K_1 = \frac{1}{2} mv^2$ (i) 1/2

KE of the second body $K_2 = \frac{1}{2} m(3v)^2$ 1/2

$$\frac{1}{2} m (3v)^2 = \frac{9}{2} mv^2 \text{..... (ii)} \quad 1/2$$

Dividing (ii) by (i) we have

$$\frac{K_2}{K_1} = \frac{\frac{9}{2} mv^2}{\frac{1}{2} mv^2} = 9/1 \quad 1/2$$

Thus, the kinetic energy of the second body is nine times the kinetic energy of the first body.

- 26. c
- 27. c
- 28. b
- 29. c
- 30. c
- 31. c
- 32. a
- 33. a
- 34. b
- 35. b
- 36. d
- 37. d
- 38. b
- 39. b
- 40. d
- 41. b