Half Yearly Examination December – 2024
Science – Answer Key
X Standard

Question No.	Answer Key	Marks
	Part - I	
1	(b) NKg^{-1}	1
2	(c) both (a) and (b)	1
3	(b) 20 kHz	1
4	(c) O_3	1
5	(b) zero	1
6	(b) Hg	1
7	(b) stem	1
8	(b) 33 segments	1
9	(d) DNA ligase	1
10	(c) Jean Baptiste Lamarck	1
11	(a) May 31	1
12	(a) Folder	1
	Part - II	
13.	The ratio of the sine of the angle of incidence and sine of the angle of refraction is equal to the ratio of refractive indices of the two media. This law is also known as Snell's law. $\frac{\sin i}{\sin r} = \frac{\mu_2}{\mu_1}$	1 1
14	a) Infrasonic - 10 Hz b) Echo - Ultrasonography c) Ultrasonic - 22 kHz d) High pressure region- - Compressions	2
15	The number of atoms present in the molecule is called its 'Atomicity'. E.g., Atomicity of Oxygen is 2	1 1
16	• Copper is used in manufacturing electric cables and other electric appliances. • Copper is used for making utensils, containers, calorimeters and coins. • Copper is used in electroplating.	Any 2
17	The simplest ketone is Propanone. It's structural formula: CH_3 - C - CH_3 ‖ O	1 1
18	Respiratory quotient is the ratio of volume of carbon dioxide liberated and the volume of oxygen consumed during respiration. It is expressed as, Respiratory Quotient (RQ) = $\frac{Volume\ of\ CO_2\ liberated}{volume\ of\ O_2\ consumed}$	1 1
19	a) True. b) True.	1 1
20	Ethnobotany is the study of a region's plants and their practical uses through the traditional knowledge of the local culture of people.	2

21	E-wastes are generated from spoiled, outdated, non-repairable electrical and electronic devices.	**2**
22	Let T^0 C be the required temperature. Let V_1, V_2 be the velocity of sound at temperatures T_1K and T_2K respectively. T_1 = 273 K(0^OC) and T_2 = (T^OC + 273 K) $\frac{v_2}{v_1} = \sqrt{\frac{T_2}{T_1}} = \sqrt{\frac{273+T}{273}} = 2$ Here it is given that $\frac{v_2}{v_1} = 2$ So, $\frac{273+T}{273} = 2$ T = (273 X4) – 273 = 819^O C	**2**
	PART - III	
23.	i. Light is a form of energy. ii. Light always travels along a straight line. iii. Light does not need any medium for its propagation. It can even travel through a vacuum. iv. The speed of light in vacuum or air is, c = 3×10^8 ms^{-1} v. Since light is in the form of waves, it is characterized by a wavelength (λ) and a frequency (v), which are related by the following equation: c = vλ (c = velocity of light). vi. Different coloured light has a different wavelength and frequency.	Any 4 4
24.	<table><tr><th>Nuclear Fission</th><th>Nuclear Fusion</th></tr><tr><td>The process of breaking up (splitting) of a heavy nucleus into two smaller nuclei is called 'nuclear fission'.</td><td>Nuclear fusion is the combination of two lighter nuclei to form a heavier nucleus.</td></tr><tr><td>Can be performed at room temperature.</td><td>Extremely high temperature and pressure is needed.</td></tr><tr><td>Alpha, beta and gamma radiations are emitted.</td><td>Alpha rays, positrons, and neutrinos are emitted.</td></tr><tr><td>Fission leads to emission of gamma radiation. This triggers the mutation in the human gene and causes genetic transform diseases.</td><td>Only light and heat energy is emitted.</td></tr></table>	**4**
25.	a) The current flowing through a conductor is said to be one ampere, when a charge of one coulomb flows across any cross-section of a conductor, in one second. Hence, 1 ampere = $\frac{1\ coloumb}{1\ second}$ b) At a constant temperature, the steady current 'I' flowing through a conductor is directly proportional to the potential difference 'V' between the two ends of the conductor. $I \propto V$, V = IR	**4**
26.	a) When iron is exposed to moist air, it forms a layer of brown hydrated ferric oxide on its surface. This compound is known as rust and the phenomenon of formation of rust is known as rusting. $4Fe + 3O_2 + xH_2O \rightarrow 2Fe_2O_3.\ xH_2O$ (Rust). b) Dilute or concentrated nitric acid (HNO_3) renders aluminium passive. Because nitric acid does not attack aluminium but it renders aluminium passive due to the formation of an oxide film on its surface.	**2** **2**

27. **4**

- A soap molecule contains two chemically distinct parts that interact differently with water.
- It has one polar end, which is a short head with a carboxylate group (-COONa) and one non – polar end having the long tail made of the hydrocarbon chain.
- The polar end is hydrophilic (Water-loving) in nature and this end is attracted towards the water. The non – polar end is hydrophobic (Water hating) in nature and it is attracted towards dirt or oil on the cloth,
- Thus, the hydrophobic part of the soap molecule traps the dirt and the hydrophilic part makes the entire molecule soluble in water.
- When soap or detergent is dissolved in water, the molecules join together as clusters called 'micelles'. Their long hydrocarbon chains attach themselves to the oil and dirt.
- The dirt is thus surrounded by the non-polar end of the soap molecules.
- The charged carboxylate end of the soap molecules makes the micelles soluble in water.
- Thus, the dirt is washed away with the soap.

28. **4**

- Blood is sucked by the pharynx.
- Anterior and Posterior Suckers are provided, by which the animal attaches itself to the body of the host.
- The three Jaws, inside the mouth, causes a painless Y – shaped wound in the skin of the host,
- The salivary glands produce Hirudin, which does not allow the blood to coagulate. So, the continuous supply of blood is maintained.
- Parapodia and Setae are absent.
- Blood is stored in the crop. It gives nourishment to the leech for several months. So there is no elaborate secretion of the digestive juices and enzymes.

29 **4**

- Transport of respiratory gases (Oxygen and CO_2).
- Transport of digested food materials to the different body cells.
- Transport of hormones.
- Transport of nitrogenous excretory products like ammonia, urea and uric acid.
- It is involved in protection of the body and defense against diseases.
- It acts as buffer and also helps in regulation of pH and body temperature.
- It maintains proper water balance in the body.

30.

a) The fusion involving two polar nuclei and a sperm nucleus, that occurs in double fertilization in a seed plant and results in the formation of endosperm, is called the triple fusion. **2**

b) Phenotype: The external expression of a particular trait is known as the phenotype. **2**
Genotype : The genetic expression of an organism is a genotype.

31. **4**

Factors	Type-1 Insulin dependent diabetes mellitus(IDDM)	Type-2 Non-insulin dependent diabetes mellitus (NIDDM)
Prevalence	10-20%	80-90%
Age of onset	Juvenile onset (< 20 years)	Maturity onset (>30 years)
Body weight	Normal or Underweight	Obese
Defect	Insulin deficiency due to destruction of β-cells	Target cells do not respond to insulin
Treatment	Insulin administration is necessary	Can be controlled by diet, exercise and medicine

32.	Given, $[H^+] = 10^{-4}$ M pOH = - $\log_{10}[OH^-]$ = -$\log_{10}[10^{-4}]$ = - (-4 X $\log_{10}10$) = - (-4) = 4 Since, pH + pOH = 14 pH = 14 – pOH =14 – 4 = 10	**1** **1** **1** **1**
	PART IV	
33.	Let, 'm' be the mass of a moving body, moving along a straight line with an initial speed V. After a time interval of 't', the velocity of the body changes to v due to the impact of an unbalanced external force F. Initial momentum of the body P_i = mu Final momentum of the body P_f = mv Change in momentum $\Delta p = P_i - P_f$ – mv – mu By Newton's second law of motion, Force, F ∝ rate of change of momentum F ∝ change in momentum / time $F \propto \frac{mv-mu}{t}$ $F = k.\frac{m(v-u)}{t}$ Here, k is the proportionality constant. k = 1 in all systems of units. Hence, $F = m.\frac{(v-u)}{t}$ Since, acceleration = change in velocity/time, $a = \frac{v-u}{t}$ Hence, we have F = m × a Force = mass × acceleration	7
	(OR)	
a)	Joule's law of heating states that the heat produced in any resistor is directly proportional to the square of the current passing through the resistor directly proportional to the resistance of the resistor. directly proportional to the time for which the current is passing through the resistor. a) H α I^2Rt	2 1
b)	Because, It has high resistivity, It has a high melting point, It is not easily oxidized.	2
c)	When a large current passes through the circuit, the fuse wire melts due to Joule's heating effect and hence the circuit gets disconnected. Therefore, the circuit and the electric appliances are saved from any damage.	2

34 a)

- An atom is no longer indivisible.
- Atoms of the same element may have different atomic mass.
- Atoms of different elements may have the same atomic masses.
- Atoms of one element can be transmuted into atoms of other elements. In other words, an atom is no longer indestructible.
- Atoms may not always combine in a simple whole-number ratio.
- Atom is the smallest particle that takes part in a chemical reaction.
- The mass of an atom can be converted into energy [$E = mc^2$].

5

b)

The molecular mass of water (H_2O) is 18.
18 g of water molecule = 1 mole.
018 g of water = $\frac{1}{18}$ X 0.18 = .01 mole
1 mole of water (Avogadro's number) contains 6.023 × 1023 water molecules.
0.01 mole of water contain 0.01 X 6.023 x 10^{23} = 6.023 X 10^{21} molecules.

2

(OR)

Ethanol is manufactured in industries by the fermentation of molasses, which is a by-product obtained during the manufacture of sugar from sugarcane. Molasses is a dark coloured syrupy liquid left after the crystallization of sugar from the concentrated sugarcane juice. Molasses contain about 30% of sucrose, which cannot be separated by crystallization. It is converted into ethanol by the following steps:

(i) Dilution of molasses :

Molasses is first diluted with water to bring down the concentration of sugar to about 8 to 10 percent. 1

(ii) Addition of Nitrogen source :

Molasses usually contains enough nitrogenous matter to act as food for yeast during the fermentation process. If the nitrogen content of the molasses is poor, it may be fortified by the addition of ammonium sulphate or ammonium phosphate. 1

(iii) Addition of Yeast: 1

The solution obtained in step (ii) is collected in large 'fermentation tanks' and yeast is added to it. The mixture is kept at about 303K for a few days. During this period, the enzymes invertase and zymase present in yeast, bring about the conversion of sucrose into ethanol.

$$\underset{\text{Sugar}}{C_{12}H_{22}O_{11}} + H_2O \xrightarrow{invertase} \underset{\text{Glucose}}{C_6H_{12}O_6} + \underset{\text{Fructose}}{C_6H_{12}O_6}$$

$$\underset{\text{Glucose}}{C_6H_{12}O_6} \xrightarrow{zymase} 2\,\underset{\text{Ethanol}}{C_2H_5OH} + 2CO_2$$

2

The fermented liquid is technically called wash.

(iv) Distillation of 'Wash':

The fermented liquid (i.e., wash), containing 15 to 18 percent alcohol, is now subjected to fractional distillation. The main fraction drawn is an aqueous solution of ethanol which contains 95.5% of ethanol and 4.5% of water. This is called rectified spirit. This mixture is then refluxed over quicklime for about 5 to 6 hours and then allowed to stand for 12 hours. On distillation of this mixture, pure alcohol (100%) is obtained. This is called absolute alcohol. 2

35. a) Using genetic engineering techniques, medicinally important valuable proteins or

	polypeptides, which form the potential pharmaceutical products for the treatment of various diseases have been developed on a commercial scale. Pharmaceutical products developed by rDNA technique: Insulin used in the treatment of diabetes. Human growth hormone used for treating children with growth deficiencies. Blood clotting factors are developed to treat haemophilia. Tissue plasminogen activator is used to dissolve blood clots and to prevent heart attack. Development of vaccines against various diseases like hepatitis B and rabies.	5
b)	Genetic engineering is the manipulation and transfer of genes from one, organism to another organism to create a new DNA called as recombinant DNA(rDNA).	2
	(OR)	
a)	Recharge pit: In this method, the rainwater is first collected from the roof tops or open spaces and is directed into the percolation pits through pipes for filtration. After filtration the rainwater enters the recharge pits or ground wells. People living in rural areas adopt a variety of water collecting methods to capture and store as rain water. Some of the methods used are- (i) Digging of tanks or lakes (Eris): It is one of the traditional water harvesting system in Tamil Nadu. Eris are constructed in such a way that if the water in one eri overflows, it automatically gets diverted to the eri of the next village, as these eris are interconnected. (ii) Ooranis: These are small ponds to collect rainwater. The water is used for various domestic purposes (drinking, washing and bathing). These ponds cater the nearby villages.	5
b)	Stage is the background appearing when we open the scratch window. The background will most often be white. You can change the background colour as you like.	2