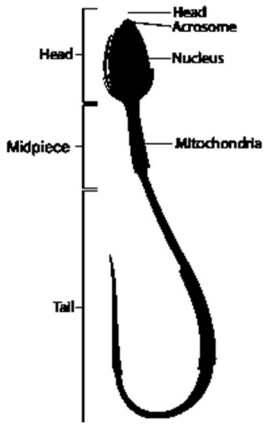
Half Yearly Common Examination Dec– 2023
Science – Answer Key

X Standard

<table>
<tr><th>Question No.</th><th>Answer Key</th><th>Marks</th></tr>
<tr><td>1.</td><td>Mere attempt (all choices are correct)</td><td>1</td></tr>
<tr><td>2.</td><td>(d) electrical energy</td><td>1</td></tr>
<tr><td>3.</td><td>(c) Alpha decay</td><td>1</td></tr>
<tr><td>4.</td><td>(b) Li > Na > K > Rb > Cs</td><td>1</td></tr>
<tr><td>5.</td><td>$Fe_2O_3.xH_2O$</td><td>1</td></tr>
<tr><td>6.</td><td>(b) 11g</td><td>1</td></tr>
<tr><td>7.</td><td>(b) alkyne</td><td>1</td></tr>
<tr><td>8.</td><td>(d) Androecium and Gynoecium</td><td>1</td></tr>
<tr><td>9.</td><td>(b) 33 segments</td><td>1</td></tr>
<tr><td>10.</td><td>(c) Anterior pituitary</td><td>1</td></tr>
<tr><td>11.</td><td>(a) Radio – Carbon method</td><td>1</td></tr>
<tr><td>12.</td><td>(d) Lymphoma</td><td>1</td></tr>
<tr><td>13.</td><td>This law states that every particle of matter in this universe attracts every other particle with a force. This force is directly proportional to the product of their masses and inversely proportional to the square of the distance between the centres of these masses. The direction of the force acts along the line joining the masses.
$F=\frac{m_1 m_2}{r^2}$</td><td>1
1</td></tr>
<tr><td>14.</td><td>lengthening of the eyeball</td><td>2</td></tr>
<tr><td>15.</td><td>• Mosquitos
• bats
• dogs</td><td>1
1</td></tr>
<tr><td>16.</td><td><table><tr><th>Atom</th><th>Molecule</th></tr><tr><td>An atom is the smallest particle of an element</td><td>A molecule is the smallest particle of an element or compound.</td></tr><tr><td>Atom does not exist in free state except in noble gas</td><td>Molecule exists in a free a state</td></tr></table></td><td>Any two points
2</td></tr>
<tr><td>17.</td><td>The solubility of O_2 in water is more at low temperature and therefore the amount of dissolved O_2 is more in the water of cold regions.</td><td>2</td></tr>
<tr><td>18.</td><td>a) Ethanal
b) Propanone</td><td>1
1</td></tr>
<tr><td>19.</td><td>• regulates the flow of blood in a single direction
• prevents back flow of blood.</td><td>1
1</td></tr>
</table>

20.		**2**
21.	• 'Scratch' is a software used to create animations, cartoons and games easily. • Scratch is a visual programming language.	**2**
22.	F2 = 25N , F1 = 15 N Resultant force = F2 – F1 = 25 – 15 = 10 N The direction of the resultant force is along the direction of the larger force, i.e. 25 N	**2**
	PART - 111	
23.	• Light is a form of energy. • Light always travels along a straight line. • Light does not need any medium for its propagation. It can even travel through vacuum. • The speed of light in vacuum or air is, c = 3 × 108 ms^{-1}. • 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 = v λ (c - velocity of light).	Any 4 4
24.	The ideal gas equation is an equation, which relates all the properties of an ideal gas. An ideal gas obeys Boyle's law and Charles' law and Avogadro's law. According to Boyle's law, $\frac{P}{V}$ = constant (3.1) According to Charles's law, $\frac{V}{T}$ = constant (3.2) According to Avogadro's law, $\frac{V}{n}$ = constant (3.3) After combining equations (3.1), (3.2) and (3.3), you can get the following equation. $\frac{PV}{nT}$ = constant (3.4) The above relation is called the combined law of gases. If you consider a gas, which contains μ moles of the gas, the number of atoms contained will be equal to μ times the Avogadro number, N_A. i.e. $n = \mu N_A$. (3.5) Using equation (3.5), equation (3.4) can be written as $\frac{PV}{\mu N_A T}$= constant The value of the constant in the above equation is taken to be k_B, which is called as Boltzmann constant (1.38×10^{-23} JK^{-1}). Hence, we have the following equation: $\frac{PV}{\mu N_A T} = k_B$ $PV = \mu N_A k_B T$ Here, $\mu N_A k B_T = R$, which is termed as universal gas constant whose	**4**

value is 8.31 J $mol^{-1}K^{-1}$.

PV = RT

Ideal gas equation is also called as equation of state because it gives the relation between the state variables and it is used to describe the state of any gas

25. **4**

Properties	α rays	β rays	γ rays
What are they	Helium nucleus ($_2He^4$)	They are electrons ($_{-1}e^0$)	They are electro magnetic waves
Charge	Positively charged particles. Charge of each alpha particle = +2e	Negatively charged particles. Charge of each beta particle = –e	Neutral particles. Charge of each gamma particle = zero
Ionising power	100 time greater than β rays and 10,000 times greater than γ rays	Comparatively low	Very less ionization power
Penetrating power	Low penetrating power (even stopped by a thick paper)	Penetrating power is greater than that of α rays. They can penetrate through a thin metal foil.	They have a very high penetrating power greater than that of β rays. They can penetrate through thick metal blocks.
Effect of electric and magnetic field	Deflected by both the fields. (in accordance with Fleming's left hand rule)	Deflected by both the fields; but the direction of deflection is opposite to that for alpha rays. (in accordance with Fleming's left hand rule)	They are not deflected by both the fields.
Speed	Their speed ranges from 1/10 to 1/20 times the speed of light.	Their speed can go up to 9/10 times the speed of light.	They travel with the speed of light.

26.	a) Froth floatation process: When the impurity is heavier than the ore, this method can be used. Principle: This process depends on the preferential wettability of the ore with oil (pine oil) and the gangue particles by water. Lighter ores, such as sulphide ores, are concentrated by this method. e.g., Zinc blende (ZnS). b) i) $CuO + O_2 \xrightarrow{<137\ K} 2CuO$ (Copper II Oxide - black) ii) $CuO + O_2 \xrightarrow{>13\ K} 2Cu_2O$ (Copper I Oxide - red)	**2** **2**
27.	• Chemical Equilibrium: • It is state of a reversible chemical reaction in which no change in the amount of the reactants and products takes place. • Characteristics of equilibrium • In a chemical equilibrium, the rates of the forward and backward reactions are equal. • The observable properties such as pressure, concentration, colour, density, viscosity etc., of the system remain unchanged with time. • The chemical equilibrium is a dynamic equilibrium, because both the forward and backward reactions continue to occur even though it appears static externally. • In physical equilibrium, the volume of all the phases remain constant.	**2** **2**
28.	Chloroplasts are green plastids containing green pigment called chlorophyll. Chloroplasts are oval shaped organelles having a diameter of 2-10 micrometer and a thickness of 1-2 micrometer.  1. Envelope: Chloroplast envelope has outer and inner membranes which is seperated by intermembrane space. 2. Stroma: Matrix present inside to the membrane is called stroma. It contains DNA, 70 S ribosomes and other molecules required for protein synthesis. 3. Thylakoids: It consists of thylakoid membrane that encloses thylakoid lumen. Photosynthetic pigments are present in thylakoids. Thylakoids forms a stack of disc like structures called a grana (singulargranum). 4. Grana: Thylakoids arranged in the form of discs stacked one above the other called granum. Grana are inter connected by stroma lamella.	**2** **2**
29.	• The pea plant is self-pollinating and so it is very easy to raise pure breeding individuals. • It has a short life span, as it is an annual. • It is easy to cross-pollinate. • It has deeply defined contrasting characters. • The flowers are bisexual.	**4**

30

Using genetic engineering techniques medicinally important valuable proteins or polypeptides that form the potential pharmaceutical products for treatment of various diseases have been developed on a commercial scale.

Pharmaceutical products developed by rDNA technique

a. Insulin used in the treatment of diabetes.
b. Human growth hormone used for treating children with growth deficiencies.
c. Blood clotting factors are developed to treat haemophilia.
d. Tissue plasminogen activator is used to dissolve blood clots and prevent heart attack.
e. Development of vaccines against various diseases like Hepatitis B and rabies

4

31

a) Insulin deficiency occur due to the destruction of B – cells of the pancreas, characterized by abnormally elevated blood glucose level resulting from inadequate insulin secretion.

2

b)

Organs	Membranous Covering	Location
Brain	Meninges	Cranial Cavity
Kidney	Capsule	Abdominal cavity
Heart	Pericardium	Enclosed in thoracic cavity
Lungs	Pleura	Mediastinum

2

32

Current flowing through $I_1 = \frac{V}{R_1} = \frac{10}{5} = 2$ ohm **1**

Current flowing through $I_2 = \frac{V}{R_2} = \frac{10}{10} = 1$ ohm **1**

Current flowing through $I_3 = \frac{V}{R_3} = \frac{10}{20} = 0.5$ ohm **1**

Total current $I = I_1 + I_2 + I_3 = 2 + 1 + 0.5 = 3.5$ ohm

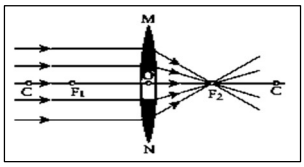
Total resistance in the circuit $\frac{1}{R_P} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$

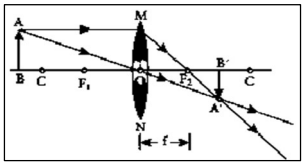
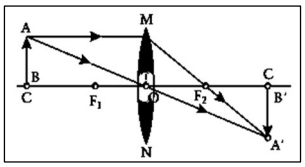
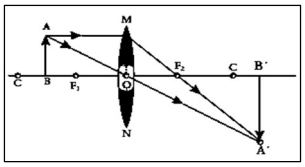
$= \frac{1}{5} + \frac{1}{10} + \frac{1}{20} = \frac{7}{20}$

$R_p = \frac{20}{7} = 2.857$ ohm **1**

PART-IV

33. **7**

Object position	Ray diagram	Size and nature of the image
At infinity		Smaller than object Real image

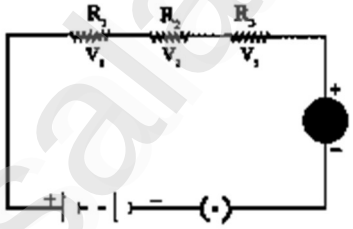
Beyond C		Smaller than the object Real and inverted
At C		Size of the image is same as that of the object Real and inverted
Between F and C		Size of the image is bigger than that of the object Real and inverted

(or)

Resistors in series:

A series circuit connects the components one after the other to form a 'single loop'

A series circuit has only one loop through which current can pass. If the circuit is interrupted at any point in the loop, no current can pass through the circuit and hence no electric appliances connected in the circuit will work. Series circuits are commonly used in devices such as flashlights. Thus, if resistors are connected end to end, so that the same current passes through each of them, then they are said to be connected in series



Let, three resistances R_1, R_2 and R_3 be connected in series (Figure 4.6). Let the current flowing through them be I. According to Ohm's Law, the potential differences V_1, V_2 and V_3 across R_1, R_2 and R_3 respectively, are given by:

$V_1 = I R_1$ (4.7)

$V_2 = I R_2$ (4.8)

$V_3 = I R_3$

The sum of the potential differences across the ends of each resistor is given by:

$V = V_1 + V_2 + V_3$

Using equations (4.7), (4.8) and (4.9), we get

$V = I R_1 + I R_2 + I R_3$ (4.10)

The effective resistor is a single resistor, which can replace the resistors effectively, so as to allow the same current through the electric circuit.

Let, the effective resistance of the series-combination of the resistors, be R_S.

Then, $V = I R_S$ (4.11) Combining equations (4.10) and (4.11),

you get, $I R_S = I R_1 + I R_2 + I R_3$ $R_S = R_1 + R_2 + R_3$

The equivalent resistance in a series combination is greater than the highest of the individual resistances.

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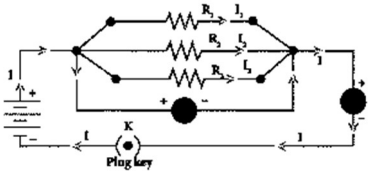
Resistances in Parallel:



A parallel circuit has two or more loops through which current can pass. Consider that three resistors R_1, R_2 and R_3 are connected across two common points A and B. The potential difference across each resistance is the same and equal to the potential difference between A and B. This is measured using the voltmeter. The current I arriving at A divides into three branches I_1, I_2 and I_3 passing through R_1, R_2 and R_3 respectively.

According to the Ohm's law, you have,

$I_1 = \frac{V}{R_1}$; $I_2 = \frac{V}{R_2}$; $I_3 = \frac{V}{R_3}$

The total current through the circuit is given by $I = I_1 + I_2 + I_3$

Using equations (4.13), (4.14) and (4.15), you get

$I = \frac{V}{R_1} + \frac{V}{R_2} + \frac{V}{R_3}$

Let the effective resistance of the parallel combination of resistors be R_P. Then,

$I = \frac{V}{R_P}$

Combining equations (4.16) and (4.17), you have

$\frac{V}{R_P} = \frac{V}{R_1} + \frac{V}{R_2} + \frac{V}{R_3}$

$\frac{1}{R_P} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$

The equivalent resistance in a parallel combination is less than the lowest of the individual resistances

34 a).

Concentration of ore: The ore is crushed and the concentrated by froth floatation process.

Roasting: The concentrated ore is roasted in excess of air. During the process of roasting, the moisture and volatile impurities are removed. Sulphur, phosphorus, arsenic and antimony are removed as oxides. Copper pyrite is partly converted into sulphides of copper and iron.

$2\ CuFeS_2 + O_2 \rightarrow Cu_2S + 2\ FeS + SO_2 \uparrow$

Smelting: The roasted ore is mixed with powdered coke and sand and is heated in a blast furnace to obtain matte (Cu_2S + FeS) and **slag.** The slag is removed as waste.

Bessemerisation: The molten matte is transferred to Bessemer converter in order to obtain blister copper. Ferrous sulphide from matte is oxidized to ferrous oxide, which is removed as slag using silica.

$2\ FeS + 3\ O_2 \rightarrow 2\ FeO + 2\ SO_2 \uparrow$

$FeO + SiO_2 \rightarrow FeSiO_3$ (slag) (Iron silicate)

$2\ Cu_2S + 3O_2 \rightarrow 2\ Cu_2O + 2\ SO_2 \uparrow$

$2\ Cu_2O + Cu_2S \rightarrow 6\ Cu + SO_2 \uparrow$ (Blister copper)

Refining: Blister copper contains 98% of pure copper and 2% of impurities and is purified by electrolytic refining. This method is used to get metal of a high degree of purity. For electrolytic refining of copper, we use:

Cathode: A thin plate of pure copper metal. **Anode**: A block of impure copper metal. **Electrolyte:** Copper sulphate solution acidified with sulphuric acid. When electric current is passed through the electrolytic solution, pure copper gets deposited at the cathode and the impurities settle at the bottom of the anode in the form of sludge called anode mud.

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or

b).

i) Double Displacement Reactions :

When two compounds react, if their ions are interchanged, then the reaction is called double displacement reaction. The ion of one compound is replaced by the ion of the another compound. Ions of identical charges are only interchanged, i.e., a cation can be replaced by other cations. This reaction is also called 'Metathesis Reaction'.

Types:

(i) Precipitation Reactions

(ii) Neutralization Reactions

(i) Precipitation Reactions:

When aqueous solutions of two compounds are mixed, if they react to form an insoluble compound and a soluble compound, then it is called precipitation reaction.

The insoluble compound, formed as one of the products, is a precipitate and hence the reaction is so called.

When the clear aqueous solutions of potassium iodide and lead (II) nitrate are mixed, a double displacement reaction takes place between them.

$$Pb(NO_3)_{2(aq)} + 2KI_{(aq)} \rightarrow PbI_{2(s)}\downarrow + 2KNO_{3(aq)}$$

Potassium and lead displace or replace one other and form a yellow precipitate of lead (II) iodide

(ii) Neutralization Reactions:

It is another type of displacement reaction in which the acid reacts with the base to form a salt and water. It is called 'neutralization reaction' as both acid and base neutralize each other.

Reaction of sodium hydroxide with hydrochloric acid is a typical neutralization reaction. Here, sodium replaces hydrogen from hydrochloric acid forming sodium chloride, a neutral soluble salt.

$$NaOH_{(aq)} + HCl_{(aq)} \rightarrow NaCl_{(aq)} + H_2O_{(l)}$$

ii)

$pH = - \log_{10}[H^+] = - \log_{10}(10^{-4}) = - \{-4 \log (_{10}10)\} = 4$

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35.a).

Events of the menstrual cycle and changes in ovary and changes in the uterus.

Phase	Days	Changes in Ovary	Changes in Uterus	Hormonal changes
Menstrual phase	4 – 5 days	Development of primary follicles.	Breakdown of uterine endometrial lining leads to bleeding.	The decrease in progesterone and oestrogen.
Follicular phase	6th – 13th day	Primary follicles grow to become a fully mature Graafian follicle.	Endometrium regenerates through proliferation.	FSH and Oestrogen increase.
Ovulatory phase	14th day	The Graafian follicle ruptures, and releases the ovum (egg).	Increase in endometrial thickness.	LH peak.

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	Luteal phase	15th – 28th day	Emptied Graafian follicle develops into corpus luteum.	The endometrium is prepared for implantation if fertilization of the egg takes place if fertilization does not occur corpus luteum degenerates, uterine wall ruptures, bleeding starts and unfertilized egg is expelled.	LH and FSH decrease, Corpus luteum produces progesterone and its level increases followed by a decline, if menstrual bleeding occurs.	

or

b).

Structure of DNA:-

DNA is the hereditary material, as it contains the genetic information. It is a large molecule consisting of millions of nucleotides, so it is called a polynucleotide. Each nucleotide consists of three components.

(a) A sugar molecule – Deoxyribose sugar

(b) A nitrogenous base – There are two types of the nitrogenous base in DNA they are

- Purines (Adenine and Guanine)
- Pyrimidines (Cytosine and Thymine)

(c) A phosphate group – The polynucleotide chains from a double helix. Nitrogenous bases in the centre are linked to sugar – phosphate units, which form the backbone of the DNA. Pairing between the nitrogenous bases is very specific and is always between purine and pyrimidine, linked by hydrogen bonds.

Adenine (A) links Thymine (T) with two hydrogen bonds [A=T]. Cytosine (C) links Guanine (G) with three hydrogen bonds (C = G). The hydrogen bonds between the nitrogenous bases make the DNA molecule stable. The nucleotides in a helix are joined together by phosphodiester

The biological significance of DNA:

- It is responsible for the transmission of heredity information from one generation to the next generation.
- It contains the information required for the formation of proteins.
- It controls the developmental process and life activities of an organism.

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