

10th Science Public Exam - 2023

Important Numerical Problems 2, 4 Marks Ans Unit wise (1, 2, 3, 4, 5, 6, 7, 9, 10)

Lesson - 1 : laws of motion

Exercises (3)

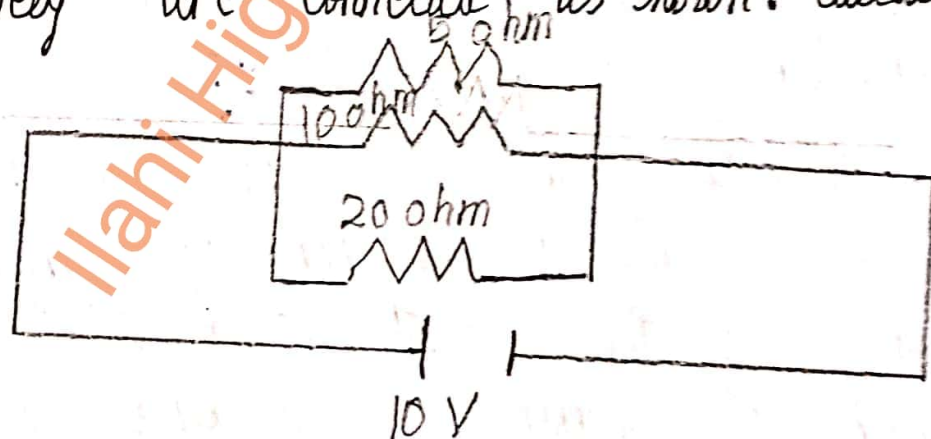
- Two bodies have a mass ratio of 3:4 the force applied on the bigger mass produces an acceleration of 12 ms^{-2} . What could be the acceleration of the other body, if the same force acts on it. ✖
- A ball of mass 1 kg moving with a speed of 10 ms^{-1} rebounds after a perfect elastic collision with the floor. Calculate the change in linear momentum of the ball. ✖
- A mechanic unscrew a nut by applying a force of 140 N with a spanner of length 40 cm. What should be the length of spanner if a force of 40 N is applied to unscrew the same nut? ✖
- The ratio of masses of two planets is 2:3 and the ratio of their radii is 4:7 find the ratio of their accelerations due to gravity.

Examples (Q)

1. Calculate the velocity of a moving ^{*}body of mass 5 kg whose linear momentum is 2.5 kgms^{-1} .
2. A door is pushed, at a point whose distance from the hinges is 90 cm, with a force of 40 N. Calculate the moment of the force about the hinges.

Lesson - 14 = Pending (Q) missing ans

1. In the circuit diagram given below, three resistors R_1 , R_2 and R_3 of 5Ω , 10Ω and 20Ω respectively are connected as shown. Calculate.



- A) Current through each resistor
- B) Total current in the circuit
- C) Total resistance in the circuit

Lesson - 2 : OPTICS.

Exercises (Q)

1. An object is placed at a distance 20 cm from a convex lens of focal length 10 cm. Find the image distance and nature of the image. ✖
2. An object of height 3 cm is placed at 10 cm from a concave lens of focal length 15 cm. Find the size of the image. ✖

Examples (Q)

3. A beam of light passing through a diverging lens of focal length 0.3 m appear to be focused at a distance 0.2 m behind the lens. Find the position of the object. ✖
4. A person with myopia can see objects placed at a distance of 4 m. If he wants to see objects at a distance of 20 m, what should be the focal length and power of the concave lens he must wear? ✖
5. For a person with hypermetropia, the near point has moved to 1.5 m. Calculate the focal length of the correction lens in order to make his eyes normal. ✖

Lesson - 3 : Thermal Physics

Exercises (B)

1. Find the final temperature of a copper rod. Whose area of cross section changes from 10 m^2 to 11 m^2 due to heating. The copper rod is initially kept at 90 K . (Coefficient of superficial expansion is $0.0021 / \text{K}$). ✖
2. Calculate the coefficient of cubical expansion of a zinc bar. Whose volume is increased 0.25 m^3 from 0.3 m^3 due to the change in its temperature of 50 K .

Examples (B)

3. Keeping the temperature as constant, a gas is compressed four times of its initial pressure. The volume of gas in the container changing from 20 cc ($V_1 \text{ cc}$) to $V_2 \text{ cc}$, find the volume V_2 . ✖

Lesson - 4 : Electricity (Please Refer book in All Example sums)

Exercises (B)

- ① A torch bulb is rated at 3 V and 600 mA . Calculate it's. (a) power (b) resistance (c) energy consumed if it is used for 4 hour . ✖

2. A 100 watt electric bulb is used for 5 hours daily and four 60 watt bulbs are used for 5 hours daily. Calculate the energy consumed (in kWh) in the month of January.
3. Two resistors when connected in parallel give the resultant resistance of 2 ohm; but when connected in series the effective resistance becomes 9 ohm. Calculate the value of each resistance. ✕
4. How many electrons are passing per second in a circuit in which there is a current of 5 A?
5. A piece of wire of resistance 10 ohm is drawn out so that its length is increased to three times its original length. Calculate the new resistance. ✕

Examples (B)

6. Calculate the current and the resistance of a 100 W, 200 V electric bulb in an electric circuit.
7. In the circuit diagram given below, three resistors R_1 , R_2 and R_3 of 5Ω , 10Ω and 20Ω respectively are connected as shown. Calculate.
8. Three resistors of 1Ω , 2Ω and 4Ω are connected in parallel in a circuit. If a 1Ω resistor draws a current of 1 A, find the current through the other two resistors.

✱

9. A charge of 12 coulomb flows through a bulb in 5 second. What is the current through the bulb?
10. The work done in moving a charge of 10 C across two points in a circuits is 100 J. What is the potential difference between the points? ✱
11. Calculate the resistance of a conductor through which a current of 2 A passes. when the potential difference between its ends is 30 V. ✱
12. The resistance of a wire of length 10 m is 2 ohm. If the area of cross section of the wire $2 \times 10^{-7} \text{ m}^2$, determine its (i) resistivity (ii) conductance and (iii) conductivity
13. Three resistors of resistances 5 ohm, 3 ohm and 2 ohm are connected in series with 10 V battery. Calculate their effective resistance and the current flowing through the circuit.
14. An electric heater of resistance 5Ω is connected to an electric source. If a current of 6 A flows through the heater, then find the amount of heat produced in 5 minutes. ✱

5. Acoustics

Lesson - 5 : Missing (Q) : At what temperature will the velocity of sound in air be double the velocity of sound in air at 0°C ?

Exercises (Q)

1. The thunder of cloud is heard 9.8 seconds later than the flash of lightning. If the speed of sound in air is 330 m s^{-1} , what will be the height of the cloud?
2. An ultrasonic wave is sent from a ship towards the bottom of the sea. It is found that the time interval between the transmission and reception of the wave is 1.6 seconds. What is the depth of the sea, if the velocity of sound in the seawater is 1400 m s^{-1} ?
3. Two observers are stationed in two boats 4.5 km apart. A sound signal sent by one, under water, reaches the other after 3 seconds. What is the speed of sound in the water?
4. A strong sound signal is sent from a ship towards the bottom of the sea. It is received back after is. What is the depth of sea given that the speed of sound in water 1450 m s^{-1} ?

Examples (Q)

5. A source producing a sound of frequency 90 Hz is approaching a stationary listener with a speed equal to $(1/10)$ of the speed of sound. What will be the frequency heard by the listener? ✖
6. A source producing a sound of frequency 500 Hz is moving towards a listener with a velocity of 30 m s^{-1} . The speed of the sound is 330 m s^{-1} . What will be the frequency heard by listener? ✖
7. A source of sound is moving with a velocity of 50 m s^{-1} towards a stationary listener. The listener measures the frequency of the source as 1000 Hz. What will be the apparent frequency of the source when it is moving away from the listener after crossing him? (velocity of sound in the medium is 330 m s^{-1}).

Lesson - 6 : Nuclear physics

Exercises (Q)

1. ${}_{88}\text{Ra}^{226}$ experiences three α -decay. Find the number of neutrons in the daughter element.

Examples (Q) ✖

2. A radon specimen emits radiation of 3.7×10^3 GBq per second. Convert this disintegration in terms of curie. (one curie = 3.7×10^{10} disintegration per second)
3. ${}_{92}\text{U}^{235}$ experiences one α -decay and β -decay. Find number of neutrons in the final daughter nucleus that is formed. %
4. Calculate the amount of energy released when a radioactive substance undergoes fusion and results in a mass defect of 2 kg. %

Lesson - 7 :

Exercises (A)

1. Calculate the number of water molecule present in one drop of water which weighs 0.18 g.
2. Calculate the number of moles in %
 - (i) 27g of Al
 - (ii) 1.51×10^{23} molecules of NH_4Cl
3. Calcium carbonate is decomposed on heating in the following reaction $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$ %
 - (i) How many moles of calcium carbonate are involved in this reaction?
 - (ii) Calculate the gram molecular mass of calcium carbonate involved in this reaction.
 - (iii) How many moles of CO_2 are there in this equation?

4. How many grams are there in the following?

(i) 2 moles of hydrogen molecule, H_2 %

(ii) 3 moles of chlorine molecule, Cl_2

(iii) 5 moles of sulphur molecule, S_8

(iv) 4 moles of phosphorus molecule, P_4

5. Calculate the % of each element in calcium carbonate.

(Atomic mass: C-12, O-16, Ca-40) %

6. Calculate the % of oxygen in $Al_2(SO_4)_3$. (Atomic mass: Al-27, O-16, S-32) %

7. Calculate the % relative abundance of B-10 and B-11, if its average atomic mass is 10.804 amu.

Examples (B)

8. Find the mass percentage composition of methane (CH_4).

9. Calculate the gram molar mass of the following.

1) H_2O 2) CO_2 3) $Ca_3(PO_4)_2$ %

10. Calculate the number of moles in 46 g of sodium?

11. Calculate the number of moles of a sample that contains 12.046×10^{23} atoms of iron? %

12. 1.51×10^{23} molecules of water? \leftarrow Calculate the mass of the following

13. 5×10^{23} molecules of glucose? \leftarrow of the following

14. Calculate the number of molecules in 54 gm of H_2O ?

15. Calculate % S in H_2SO_4 . %

16. Calculate the number of atoms present in 1 gram of gold (Atomic mass of Au=198)

Lesson - 9 : Missing (Q) : 1.5 g of solute is dissolved in in 15 g of water to form a saturated solution at 298K. Find out the solubility of the solute at the temperature.

Exercises (Q)

1. A solution is prepared by dissolving 45 g of sugar in 180 g of water. Calculate the mass percentage of solute. %
2. 3.5 litres of ethanol is present in 15 litres of aqueous solution of ethanol. Calculate volume percent of ethanol solution. %

Examples (Q)

%

3. A solution was prepared by dissolving 25 g of sugar in 100 g of water. Calculate the mass percentage of solute. %
4. 16 grams of NaOH is dissolved in 100 grams of water at 25°C to form a saturated solution. Find the mass percentage of solute and solvent.
5. A solution is made from 35 ml of Methanol and 65 ml of water. Calculate the volume percentage. %
6. Calculate the volume of ethanol in 200 ml solution of 20% v/v aqueous solution of ethanol. %

Lesson - 10 :

Exercises (Q)

1. Lemon juice has a pH 2, what is the concentration of H^+ ions?
2. Calculate the pH of 1.0×10^{-4} molar solution of HNO_3 . %
3. What is the pH of 1.0×10^{-5} molar solution of KOH? %

4. The hydroxide ion concentration of a solution is 1×10^{-11} M. What is the pH of the solution?

Examples (Q) All examples Problems Important

5. Calculate the pH of 0.01 M HNO_3 ?

6. The hydroxy ion concentration of a solution is 1×10^{-9} M. What is the pOH of the solution?

7. A solution has a pOH of 11.76. What is the pH of this solution?

8. Calculate the pH of 0.001 molar solution of HCl.

9. Calculate the pH of 1×10^{-4} molar solution of NaOH.

10. What would be the pH of an aqueous solution of sulphuric acid which is 5×10^{-5} mol litre⁻¹ in concentration.

11. Calculate the pH of a solution in which the concentration of the hydrogen is 1.0×10^{-8} mol litre⁻¹.

12. If the pH of a solution is 4.5, what is its pOH?

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