A. A moving coil galvanometer is converted into an ammeter of range 0 to 5mA. The galvanometer resistance is 90Ω and the shunt resistance has a value of 10Ω. If there are 50 divisions in the galvanometer-turned ammeter on either side of zero, its current sensitivity is-

1. 1 × 105 A/div
2. 2 × 104 A/div
3. **2 × 104 div/A**
4. 1 × 105 div/A

B. Sound travels in a mixture of two moles of helium and n moles of hydrogen If rms speed of gas molecules in the mixture is √2 times the speed of sound, then the value of n will be -

1. 1
2. **2**
3. 3
4. 4

C. The speed of sound in an ideal gas at a given temperature T is v. The rms speed of gas molecules at that temperature is vrms. The ratio of the velocities v and vrms for helium and oxygen gases are X and X' respectively. Then X /X' is equal to -

1. **5/√21**
2. √5/√21
3. 21/5
4. 21/√5

D. Consider the two statements (Assume the density of water to be constant):
Statement 1: A capillary tube is first dipped in hot water and then dipped in cold water. The rise is higher in hot water.
Statement 2: The capillary tube is first dipped in cold water and then in hot water. The rise is higher in cold water.

1. Statement 1 is true and Statement 2 is false
2. **Statement 1 is false and Statement 2 is true**
3. Both Statements are true
4. Both Statements are false

E. The charge flowing in a conductor changes with time as Q(T)= αt+βt2+γ3 where α,β,γ are constants. The minimum value of the current is -

1. **α− 3γ/β2**
2. α− γ2/3β
3. α− 3β2/γ

F. In a thermodynamic process work done by the gas is 1000 J & heat supplied is 200 J. Find the change in the internal energy of the gas.

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1. 800 J
2. **-800 J**
3. 1200 J
4. -1200 J

Explanation -
Q=△U+Ω
Therefore, 200=△U+1000
Therefore, △U=-800J

G. Given below are two statements: one is labeled as Assertion A and the other is labeled as Reason R

- Assertion A: The efficiency of a reversible heat engine will be highest at −273◦ C temperature of the cold reservoir.
- Reason R: The efficiency of Carnot's engine depends not only on the temperature of the cold reservoir but it depends on the temperature of the hot reservoir too and is given as n=(1−T1/T2)

In the light of the above statements, choose the correct answer from the options given below

1. A is true but R is false
2. **Both A and R are true and R is the correct explanation of A**
3. Both A and R are true but R is NOT the correct explanation of A
4. A is false but R is true

Explanation - Assertion A claims that the efficiency of a reversible heat engine is maximized at -273°C (0 Kelvin), the temperature of the cold reservoir.
Reason R is also valid as it describes the efficiency of Carnot's engine using the formula: η = 1 -T2/T1, where Tc is the temperature of the cold reservoir and Th is the temperature of the hot reservoir. However, Reason R does not directly address why the efficiency is highest at -273°C as stated in Assertion A. The formula in Reason R does demonstrate how the efficiency is influenced by the temperatures of both the hot and cold reservoirs, but it does not directly relate to the statement in Assertion A about the temperature of -273°C being the point of highest efficiency. Therefore, the correct option is (B): Both A and R are true and R is the correct explanation of A.

H. A moving coil galvanometer is converted into an ammeter of range 0 to 5mA. The galvanometer resistance is 90Ω and the shunt resistance has a value of 10Ω. If there are 50 divisions in the galvanometer-turned ammeter on either side of zero, its current sensitivity is -

1. 1 × 105 A/div
2. 2 × 104 A/div
3. **1 × 105 div/A**
4. 2 × 104 div/A

I. For the given figures, choose the correct options:

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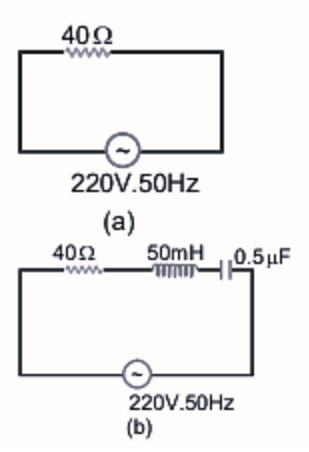

1. At resonance, the current in (b) is less than that in (a)
2. **The rms current in the circuit (b) can never be larger than that in (a)**
3. The rms current in Figure (a) is always equal to that in Figure (b)
4. The rms current in the circuit (b) can be larger than that in (a)

J. A cell of emf 90V is connected across a series combination of two resistors each of 100Ω resistance A voltmeter of resistance 400Ω is used to measure the potential difference across each resistor The reading of the voltmeter will be -

1. 45V
2. **40V**
3. 80V
4. 90V

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