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Equivalent resistance problems iit pdf

For JEE Main other Engineering Entrance Exam Preparation, JEE Main Physics Current Electricity Previous Year Questions with Solutions is given below. Multiple Choice with ONE correct answer 1.A constant voltage is applied between the two ends of a uniform metallic wire. Some heat is developed in it. The heat developed is doubled when [1980] a) both the length and the radius of the wire are halved. b)both the length and the radius of the wire are doubled c)the radius of the wire is doubled. d)the length of the wire is doubled. To. 2.The temperature resistance coefficient of a wire is 0.00125 per°C- At 300 K its resistance is 1 ohms. This resistance of the wire will be 2 ohms at [1980] a)1154 K b) 1100 K c) 1400 K d) 1127 K Ans. 3.In the circuit shown in the fig. the heat generated in the 5 ohms resistance is 10 calories per second due to the current flowing through it. The heat generated in the 4 Ohm resistance is [1981-2 marks] a)1 calories/sec.b) 2 calories/sec.c) 3 calories/sec d) 4 calories/sec. To. 4.The current i in the circuit (see Fig.) is [1983-1 mark] a)(1/45) ampere b) (1/15) ampere c) (1/10) ampere d) (1/5) Ampere Ans. 5.One piece of copper and another germanium are cooled from room temperature to 80 K. The resistance of [1988-1 Mark] a)each of them increases b)each of them increases c)Copper and germanium decreases d)Copper and germanium increases. To. (d) Copper is a metal. Its resistance decreases when the temperature drops. Germanium is a semiconductor. Its resistance increases when the temperature drops. To. 7.A steady current flows in a metallic conductor of uneven cross-section. The quantity / The constant amounts along the length of the conductor are / are: [JEE'97,lmark] a)current, electric field and drift speed b)Drift speed only c)Current and drift speed d)current only Ans. 8.In the indicated circuit, P1 R, reading the galvanometer with switch S open or closed is the same. [JEE'99, 2] To. (a) This is Kelvin's method of determining the resistance of the galvanometer by Wheatstone bridge circuitry. The deflection in the galvanometer G is open or closed at switch S. It means that there is no current through S. This happens when the potentials at both ends of S are the same. This is the state of a balanced Wheatstone bridge. IP = IQ and IR = IG 9.In the given circuit, at constant current the potential drop must pass the capacitor [2001-2 markings] a)V b)V/2 c)V/3 d)2V/3 Ans. To. 11.In the given circuit, that the current I is independent of the value of the resistance R6. Then the resistance values must meet Ans.c) Since current I is independent of the value of the resistance R6, it is clear that R1 R2, R3 and R4 are the resistors of the arms of a balanced wheatstone bridge. R1 R4 = R2R3 effective resistance between points P and Q of the electrical circuit shown in the figure is [2002-2 markings] Ans. Consider the upper segment above PQ. It is a balanced Wheatstone Bridge. The central resistance 2R is in the lower segment, the central resistance 2R becomes ineffective. 13.A 100 W bulb B1 and two 60 W bulbs B2 and B3, are connected to a 250 V source, as shown in the figure. Now W1, W2 and W3 are the output spower of the bulbs B1, B2 and B3. Then [JEE 2002 (Scr), 2] Ans. 14.Express Which of the following setups can be used to verify Ohm's law? [2003-2m] Ans. (a) Amperemeter is connected in series to the resistance network and Voltmeter is connected in parallel with the resistance network for the verification of the Ohm law. Setup (a) can be used for the purpose. 15.In the shown arrangement of the experiment of the meter bridge, if ac corresponds to zero deflection of the galvanometer x, what would its value if the radius of the wire AB is doubled? [2003] a) x b)x/4 c)4x d)2x Ans. (a) For zero deformation of the galvanometer in a meter bridge experiment, 16.Three equivalent resistors are arranged in the different combinations, as shown below. Arrange them in increasing order of power dissipation. [2003-2 Marks] Ans. 17.In illustration is a letterbox. To calculate the value of the outer resistance, it should be connected between a)B' and C' b)A and D c)C and D d)B and D Ans. (b) Postbox is Wheatstone Bridge, which has been modified to measure an unknown resistance. AB, BC and CD are the three arms. The unknown resistance is connected between A and D. 18.Six identical resistors are connected as shown in the figure. The equivalent resistance is [2004-2 markings] a)maximum between P and R b)maximum between Q and R c)maximum between P and Q d)all are equal. To. To. (a) Resistance of 2 0hms does not belong to a circuit in which emf is connected in a source. Therefore, no electricity flows through them. To. 21.When a continuous current I flows through a cylindrical element ABC. Select the right relationship. [2006-3 Brands] To. 22.A circuit is connected as shown in the figure with the switch S open. When the switch is closed, the total charge quantity flowing from Y to X is [2007-3 marks] Tos. To. To. To. 25.To Ohms law to check a student equipped with a test resistance RT, a high resistance R1, a small resistance R2, two identical galvanometers G1 and G2 and a variable voltage source V. The right circuit to carry out the experiment is Ans.. c) Theoretical 26.Light bulbs are developed taking into account the increase in the resistance of their filament with the increase in temperature. If at room temperature 100 W, 60 W and 40 W bulbs have the filament resistance R100, R60 or R40, the rlation between these resistors is. To. To. 28.A meter bridge is set up as shown to determine an unknown resistance 'X' with a standard 10 ohm resistance. The galvanometer shows zero point when typing - button is 52 cm marking. The final corrections are 1 cm and 2 cm respectively for ends A and B. The determined value of 'X'is (2011) a)10.2 ohm b) 10.6 ohm c) 10.8 ohm d) 11.1 ohm Ans. Multiple Choice with ONE or More Than ONE correct answers answers C1 From capacity 1 microfarad and capacitor C2 of capacity 2 microfarad are charged separately completely by a common battery. The two capacitors may then be separated by the same resistors at time t = 0[1989-2 markings] a) the current in each of the two discharge circuits is zero at t=0 b)The currents in the two unloading circuits are equal, but not zero. c)The currents in the two unloading circuits at t=0 are unequal. d)Capacitor C1 loses 50% of its original charge earlier than C2 loses 50% of its original charge. To. 30.In of the circuit shown in the figure, the current through : a) the 3W resistance is 0.50 A b)the 3W resistance is 0.25 A c)the 4 W resistance is 0.50 A d) the 4W resistance is 0.25 A Ans. 31.If a potential difference is carried over, the current caused by [1999-3 markings] a) an insulator at 0 K is zero b)a semiconductor at 0 K is zero c)a metal at 0 K is finally d)a p – n connection diode at 300 K is finite if it is biased the other way round. (a), (b), (d) (a) An insulator at 0 K does not allow current to flow through it. Option (a) is correct. b) A semiconductor at 0 K becomes the insulator. Obviously, the current that flows is zero. Option (b) is correct. c) A conductor becomes a superconductor at 0 K. The current will be infinite. Option (c) is incorrect. d) At reverse preload at 300K, a small finite current flows through minority charge carriers through a p-n connection diode. Option (d) is correct. Therefore, the options a), (b), and (d) are correct. 32.For the circuit shown in Figure [2009] (a)the current I represented by the dough is 7.5 mA b)the potential difference over R1 is 18 V (c)ratio of the forces discharged into R1, and R2 is 3 d)when R1 and R2 are replaced, the size of the power discharged into RL will decrease by a factor of 9 ans. :D the following question contains statement-I (assertion) and statement -2 (reason) of these statements, mark the correct choice if a)statement-1 and 2 are true and statement-2 is a correct explanation for statement-1 b)statement-1 and 2 are true and statement-2 is not a correct explanation for statement-1 c)statement-1 is true, statement-2 is base d)statement-1 is false, statement-2 is true. 33.Statement – 1 : The resistance of a semiconductor increases with the increase in temperature. Statement – 2 : In a conductive solid, the collision rate between free electrons and ions increases with the increase in temperature. [1993-2 brands] To. (d) 34.Statement – 1 : In a meter bridge experiment, zero point is measured for an unknown resistance. Now the unknown resistance is placed in a housing, which is kept at a higher temperature. The zero point can be obtained in the same place as before by reducing the value of the default resistance. Statement - 2 : Resistance of a metal increases with the increase in temperature. [2008] Ans. Question Electrical resistance of certain materials, known as superconductors, abruptly changes from an invaluable Zero, because their temperature is lowered below a critical temperature Tc(0). An intermediate characteristic of supercondensators is that their critical temperature becomes less than Tc(0) when placed in a magnetic field, i.e. the critical temperature TC(B) is a function of magnetic field strength B. The dependence of TC(B) on B is shown in the figure. 35.In the following graphs, the resistance R of a superconductor is shown as a function of its temperature T for two different magnetic fields B1 (volume-resistant line) and B2 (dashed line). If B2 is greater than B1, which of the following diagrams shows the correct variation of R with T in these fields ? To. (a) Under magnetic field, the critical temperatures decrease as indicated in the data, so the superconductors become conductors for a higher magnetic field at low temperature. 36.A superconductor has Tc(0) = 100 K. When a magnetic field of 7.5 Tesla is applied, its tc decreases to 75 K. For this material you can definitely say that. a)B = 5 Tesla, Tc (B) = 80 K b)B = 5 Tesla, 75 K < Tc (B) < 100 K c)B = 10 Tesla, 75 K < Tc (B) < 100 K d)B = 10 Tesla, Tc (B) = 70 K Ans. (b) When 'B' is increased, TC(B) decreases when the solid becomes a super conductor. If B = 7.5 tesla given that 'Tc(0) decreases from 100 K to 75 K. If 'B' is less than 7.5, then TC(B) increases stightly, it should be between 75 K and 100 K if B = 5 Tesla, 75 K < TC(B) < 100 K Matching Type 37.Column – I enter certain situations in which a straight metallic wire of resistance R is used and Column II provides some resulting effects. [2007] Ans.A) The energy stored in the capacitor is converted into heat/heat energy when connected to a wire. B)Due to the motion-electric Emf, a constant potential difference and charges of constant size appear at the ends of the wire. C)By induction, a constant charge appears and there by a constant potential difference at the ends of the conductor. D)A source of constant emf is connecized with a conductive wire, then (i) a constant potential difference (ii) a constant current and (iii) heat is generated in the wire. Subjective/Numeric integer type 38.A copper wire is stretched to make it 0.1% longer. What is the percentage change in resistance? [1978] Ans. 39.If each of the resistors shown in the figure is R in the network, what is the resistance between terminals A and B? [1978] Ans.The schematic can be redrawn as shown in the figure. This corresponds to a balanced wheatstone bridge. Since points P and Q have the same potential, no current flows in the resistance R that connects them. Resistance X between A and B is therefore used by Ans. 41.A 25 watts and a 100 watt light bulb connected in series and connected to the mains. Which one shines brighter? [1979] Ans. 42.A copper wire with a cross-sectional area of 0.5 mm2 and a length of 0.1 M is initially at 25°C and is thermally insulated by the environment. If a current of 10 amperes is set in this wire, you will find (i) the time during which the begins to melt. The change of resistance with the temperature of the wire can be neglected, ii) What will be this time when the length of the wire is doubled? To. 43.Find the potential difference between points A and B and between points B and C in stable condition. [1979] Ans. 44.All resistors in the diagram below are in Ohm. Find the effective resistance between points A and B.[1979] Ans. 45.In the circuit shown in the figure, a voltmeter reads 30 volts when it is connected to over 400 ohms resistance. Calculate what the same voltmeter will read when it is connected via the 300 ohm resistance. [1980] Ans. 46.A battery of emf 2 volts and internal resistance 0.1 ohms is charged with a current of 5 amperes. In which direction does the electricity flow into the battery? What is the potential difference between the two terminals of the battery? [1980] Ans.In to charge a battery, the positive terminal is to be connected to the positive terminal of the charger (pictured). Therefore, inside the battery is the flow direction from the positive terminal to the neagative terminal. i)Find the potential difference between points A and B and the currents through each branch. (ii)If r2 is short-circuited and point A is connected to point B, you will find the currents through E1, E2, E3 and the resistance Ans. 48.Calculate the stationary current in the 2 Ohm resistor shown in the circuit in the figure. The internal resistance of the battery is negligible and the capacity of the capacitor C is 0.2 microfarade. [1982-5 brands] To. 49.Two resistors, 400 ohms and 800 ohms are connected in series with a 6 volt battery. It is desirable to measure the current in the circuit. For this purpose, an amperemeter of 10 ohms resistance is used. What will be the reading in the amperemeter? If a voltmeter of 10,000 ohms resistance is used to measure the potential difference over the 400 ohm resistance, what will be the measured value in the voltmeter? [1982-5 brands] To. 50.A steady current passes through a cylindrical conductor. Is there an electric field inside the conductor? [1982-2 brands] Ans.Yes. There is an electric field in the ladder. In the electrostatic state, the electric field within a conductor is zero. But in this case, a current flows through the cylinder conductor. Therefore, there is an electric field inside the conductor. 51.In of the circuit shown in Figure A E,F,G,H are cells of emf 2, 1, 3 and 1 volts, and their internal resistors are 2,1,3 and 1 ohms respectively. Calculate : [1984-6 markers] i)the potential difference between B and D and ii)the potential difference between the terminals of cells G and H. Ans. 52.A part of the circuit in a stable state together with the currents flowing into the branches, the values of the resistors, etc., is Presented. Calculate the energy stored in the Ans capacitor. 53.An infinite network of resistors is constructed with 1 ohms and 2 ohms resistors, as shown in the figure. The 6 6 Battery between A and B has a negligible internal resistance: i)Show that the effective resistance between A and B is 2 ohms. ii)What is the current that passes through the 2 Ohm resistance closest to the battery? [1987-7 Brands] Ans.In case of the infinite resistance conductors, the effective resistance remains the same when an identical element is either added or removed from it. Let the effective resistance be between A and B R. The effective resistance between C and D will also be R. Ans. 55.An electrical circuit is shown in the figure. Calculate the potential difference over the resistance of 400 ohms, as measured by the voltmeter V of the resistance 400 ohms, either by applying Kirchhoff's rules or otherwise. [JEE'96, 5] To. 56.Find the emf (V) and the internal resistance (r) of a single battery corresponding to a parallel combination of two batteries of the emfs V1 and V2 respectively the internal resistors r1 and r2, with polarities, as shown in Figure [1997-5 Markings] Ans. (i) EMF of the battery is equal to the potential difference between the terminals, if no current is drawn from the battery (for external circuit) [Here, all elements in the circuit are in series] current in the internal circuit = i Ans. 58.In the circuit shown in the figure, the battery is ideal, with emf V. The capacitor is initially uncharged. The switch S is closed at time t=0. To. 59.A thin uniform wire AB of length 1 m, an unknown resistance X and a resistance of 12 W are connected by thick guide bars, as shown in the figure. A battery and a galvanometer (connected to a different jockey) are also available. Connections must be established to measure the unknown resistance X according to the principle of the Wheatstone Bridge. Answer the following questions. a)Are there positive and negative clamps on the galvanometer? b)Copy the figure in your answer book and show the battery and the galvanometer (with jockey) connected in appropriate places. (c)After appropriate connections have been established, it shall be established that no deflection takes place in the galvanometer when the slider touches the wire at a distance of 60 cm from A. Get the value of the resistor X. [2002-1 + 2 + 2 marks] Ans. (a) There are no positive and negative terminals on the galvanometer. The pointer swings on both sides of the central zero, depending on the current direction. For no current the pointer is zero, (b) Jockey is a sliding contact on a resistance wire. AB is indeed the resistance wire of the meter bridge experiment, based on the principle of the Wheatstone Bridge. Galvanometer and battery are shown in Figure 60. How to connect a battery so that the shown how a potential divider behaves? Also specify the points that can be used to take the output. [2003-2 brands] To. To. 62.The circuit shown in the figure is used to measure the value of an unknown resistor X by comparing it with a known resistor R with three different known resistors. R = R1 , R = R2 and R = R3 . that the Zero points are obtained at A,B, and C. Find out which of the above points give the most accurate reading and why? [2005-2 brands] Ans.Wheatstone Bridge is most accurate when all four resistors of the four arms are of the same order of magnitude. Zero point at B is almost in the center of the resistance wire. The resistors of the wire to the left (P) and right (Q) of B are almost the same. Obviously, the sizes X, R, P and Q as X/R = P/Q are almost identical. Therefore b position of the zero point gives the most accurate reading. To. 64.At time t = 0, a battery of 10 V is connected via points A and B in the given circuit. If the capacitors initially have no charge, at what time (in seconds) the voltage over them becomes 4 V ? To. To. 66.Two batteries with different emfs and different internal resistance are connected as shown. The voltage above AB in Volt is Ans. True / False type 67.In an electrolytic solution, the electric current is mainly due to the movement of free electrons. [1980] Ans.False. When a current flows through a solution of an electrolyte, the substance decomposes into positively and negatively charged particles, so-called ions. When an electric field is set up in the solution by dipping the electrodes, the two types of ions drift in the opposite pure direction. Their movement represents electric current in the solution. 68.Electrons in a conductor have no movement if there is no potential difference. [1982-2 brands] Ans.False.The electrons in a conductor move freely at thermal speeds. Their movement is coincidental in the absence of potential differences. The statement is incorrect. 69.The voltage diagrams for a given metal wire at two different temperatures Tl and T2 are shown in the figure. The temperature T2 is greater than T1. [1985-3 brands] Ans.True.For a metallic wire, the resistance increases with the increase in temperature. Obviously, the current in a wire reduces a higher temperature, for a certain potential difference V. In the specified I-V diagram, the current is less at T2. Fill the blanks type 70.An bulb rated for 500 watts at 100 volts is used in a circuit with a 200 volt supply. The resistance R, which must be set in series with the light bulb so that the light bulb delivers 500 watts, is..... ohm [1987-2 marks] Ans. 71.The equivalent resistance between points A and B of the specified circuit is..... [1997-2 brands] To. 72.In the circuit shown, each battery is 5V and has an internal resistance of 0.2 ohms. The measurement in the ideal voltmeter V is..... V. Ans. JEE Main Home Maths Physics Chemistry Chemistry Chemistry

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