QB365 Question Bank Software Study Materials

Current Electricity Important 2 Marks Questions With Answers (Book Back and Creative)

12th Standard

Physics

Total Marks : 40

2 Marks

20 x 2 = 40

1) Compute the current in the wire if a charge of 120 C is flowing through a copper wire in 1 minute.

Answer : The current (rate of flow of charge) in the wire is

$I = \frac{Q}{t} = \frac{120}{60} = 2A$

2) State microscopic form of Ohm's law.

Answer : Microscopic form of ohm's law is

$\vec{J} = \sigma \vec{E}$

$J = \frac{ne^2\tau}{m}\vec{E}$

$\frac{e\tau}{m} \rightarrow Drift\ velocity\ v_d$

where $\vec{J}$ - current density

σ - conductivity

$\vec{E}$ - Electric field

3) Write a short note on superconductors?

Answer : A superconductor is any material that can conduct electricity with no resistance. In most cases, materials such as metallic elements or compounds offer some resistance at room temperature, but offer less resistance at a temperature known as its critical temperature.

4) What is electric power and electric energy?

Answer : **Electric power:**

(i) The electric power P is the rate at which the electrical potential energy is delivered.

(ii) The electric power P is the rate at which the work is done.

$P = \frac{dU}{dt}(or) = \frac{dW}{dt}(or) = VI(or)\frac{V^2}{R}$

Unit: watt (W)

Electric energy:

(i) The electric energy is the product of power (P) and duration of the time (t) when electric energy is delivered.

(ii) E = Pt

Unit: watt-hour (Wh)

5) A battery has an emf of 12 V and connected to a resistor of 3 Ω. The current in the circuit is 3.93 A. Calculate

(a) terminal voltage and the internal resistance of the battery

(b) power delivered by the battery and power delivered to the resistor

Answer : The given values I = 3.93 A, ξ = 12 V,

R = 3 Ω

(a) The terminal voltage of the battery is equal to voltage drop across the resistor

V = IR = 3.93 x 3 = 11.79 V

The internal resistance of the battery,

$r = \left[\frac{\xi - V}{V}\right] R = \left[\frac{12 - 11.79}{11.79}\right] \times 3 = 0.05\Omega$

(b) The power delivered by the battery P = Iξ = 3.93 x 12 = 47.1 W

The power delivered to the resistor = I^2 R = 46.3 W

The remaining power = (47.1 – 46.3) P = 0.8 W is delivered to the internal resistance and cannot be used to do useful work. (it is equal to I^2 r).

6) Find the heat energy produced in a resistance of 10 Ω when 5 A current flows through it for 5 minutes.

Answer : R = 10 Ω, I = 5 A, t = 5 minutes = 5 x 60 s

$H = I^2 R t$

$= 5^2 \times 10 \times 5 \times 60$

$= 25 \times 10 \times 300$

$= 25 \times 3000$

= 75000 J (or) 75 kJ

7) What do you mean by internal resistance of a cell?

Answer : The internal resistance of a cell is the resistance offered to the flow of current (by the electrolyte) inside the cell.

8) Lightning is very good example of natural current. In typical lightning, there is 10^9 J energy transfer across the potential difference of 5×10^7 V during a time interval of 0.2 s.

Using this information, estimate the following quantities.

(a) total amount of charge transferred between cloud and ground

(b) the current in the lightning bolt

(c) the power delivered in 0.2 s.

Answer : Emergency transferred, $E = 10^9$ J

Potential difference, $V = 5 \times 10^7$V

Time t = 0.2s.

(c) Power $= \frac{\text{Energy}}{\text{Time}} = \frac{1 \times 10^9}{0.2}$ = 5 x 10^9 W

P = 5 GW

(b) Current $I = \frac{\text{Power}}{\text{Potiential difference}} = \frac{5 \times 10^9}{5 \times 10^7}$

$I = 10^2$ = 100 A

∴ **Q = 20C**

(a) Charge Q = It (Here, I = 100 A)

Q = 100 x 0.2 = 20 C

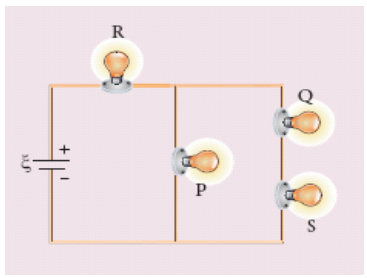
(a) Q = 20 C, (b) I = 100 A, (c) P = 5 GW

9) Four bulbs P, Q, R, S are connected in a circuit of unknown arrangement. When each bulb is removed one at a time and replaced, the following behavior is observed.

	P	Q	R	S
P removed	*	on	on	on
Q removed	on	*	on	off
R removed	off	off	*	off
S removed	on	off	on	*

Draw the circuit diagram for these bulbs.

Answer :



10) In a potentiometer arrangement, a cell of emf 1.25 V gives a balance point at 35 cm length of the wire. If the cell is replaced by another cell and the balance point shifts to 63 cm, what is the emf of the second cell?

Answer : Balancing lengths are

1_1 = 35 cm, l_2 = 63 cm

E_1 = 1.25v E_2 = ?

At the following point $E \propto 1$

$\frac{E_1}{E_2} = \frac{l_1}{l_2}$

$\therefore \frac{1.25}{E_2} = \frac{35}{63} \quad \therefore E_2 = \frac{1.25 \times 63}{35} = 2.25\text{v}$

∴ EMF of the second cell = 2.25 V

V_d = 0.03 x 10^{-3} m s^{-1}

11) Define current.

Answer : If a net charge Q passes through any cross section of a conductor in time t, then the current is defined as $I = \frac{Q}{t}$

12) What does the voltage rating refers? What is use?

Answer : Voltage rating refers AC RMS voltages. For a given bulb, if the voltage drop across the bulb is greater than voltage rating, the bulb will fuse.

13) Why nickel is used as heating element?

Answer : The heating elements are made of nichrome, an alloy of nickel and chromium. Nichrome has a high specific resistance and can be heated to very high temperatures without oxidation.

14) What is the disadvantage of electric fuse?

Answer : The only disadvantage with the above fuses is that once fuse wire is burnt due to excessive current, they need to be replaced circuit breakers (trippers) are used instead of fuses Whenever there is an excessive current produced due to a faulty wire connection, the circuit breaker switch opens. After repairing the faulty connection, we can close the circuit breaker switch is closed.

15) What is the use of electric furnace?

Answer : Furnaces used to manufacture a large number of technologically important materials such as steel, silicon carbide, quartz, gallium arsenide, etc. To produce temperatures up to 1500°C, a molybdenum-nichrome wire wound on a silica tube is used. Carbon arc furnaces produce temperatures up to 3000°C.

16) Mention are limitation of carbon resistors.

Answer : The resistors value of carbon resistors changes considerably during storage and use.

17) Why are resistors connected in series and in parallel
(i) To increase the resistor of the circuit
(ii) The resistors are connected in series.

Answer : (i) To increase the resistance of the circuit the resistor are connected in series.
(ii) When they are connected in parallel resistance of the circuit is decreased

18) What are conductors?

Answer : The substances which have an abundance free electrode are called conductors.

19) State the relation between resistivity, conductivity and relaxation time of free electrons.

Answer : Resistivity $\rho = \frac{1}{\sigma} = \frac{m}{ne^2\tau}$
Where σ - conductivity
τ - relaxation time

20) Define resistance of a conductor.

Answer : The resistance of a conductor is the ratio potential difference across the given conductor to the current passing through the conductor. R = $\frac{V}{I}$.