Applied Physics - I

Chapter 5: Electrostatics

Fill in the blanks

1. When two condensers of capacities 10 μF and 20 μF are joined in series, their equivalent capacity is _____.
2. The unit of capacity of a conductor is _____.
3. Electron Volt is the unit of _____.
4. N/C is the SI unit of _____.

Choose the correct answer

1. Three capacitors of capacitance 2 farad when connected in parallel gives the equivalent capacitance of

   (i) 2 Farad

   (ii) 6 Farad

   (iii) 4 Farad

   (iv) 8 Farad

2. The direction of electric current is from

   (i) negation end to the positive end of the cell

   (ii) negative end to the positive end of the cell

   (iii) both

   (iv) None of the above

3. Two 4μF capacitors in series is equal to

   (i) 8μF

   (ii) 2μF

   (iii) 4μF

   (iv) 16μF

Answer the following questions

1. State and explain Coulomb's law of electrostatics with mathematical expression. Define 1 Coulomb of charge.
2. What do you mean by electrostatic potential? Obtain an expression to calculate the electrostatic potential at any point due to a point charge.
3. In a hydrogen atom, the distance between the electron and proton is 5.3×10^{-11} m. Find the force of attraction between them. (Charge of one electron = 1.6×10^{-19} C)

4. Two spheres charged with equal and opposite charges experience a force of 19.6N. When they are placed 20 cm apart in a medium of relative permittivity 5, determine the charge on each sphere.
5. Define one Coulomb charge. A parallel plate capacitor has a capacitance of 50μF in air and 100 μF when immersed in oil. What is the dielectric constant K of the oil?
6. Define electric potential. Mention the factors affecting the capacity of a capacitor.
7. What is a capacitor? What is its primary function?
8. Calculate the charges on condensers 2μF and 3μF capacity connected in parallel when a potential difference of 100 V is applied across them.
9. Deduce the relation between electric potential and electric intensity.
10. Deduce an expression for equivalent capacity when three condensers of capacities C_1, C_2, C_3 are connected in series.

Chapter 6: Current Electricity

Fill in the blanks

1. In an open circuit, the emf of a cell is _____ than the potential difference between the two terminals of the cell.
2. Kilowatt-hour is the practical unit of _____.
3. In a secondary cell, _____ reaction takes place.
4. The reciprocal of resistance is called _____.
5. The unit of current is _____.
6. Resistance of a conductor _____ with increase in temperature.
7. SI unit of specific resistance is _____.
8. An electric bulb is marked "230V-100W". The resistance of its filament is _____ Ohm.
9. The difference of potential between the two terminals of a cell in an open circuit is called _____.

True or False

1. When three resistances are connected in parallel, the equivalent resistance is less than each of the resistances.
2. A primary cell converts chemical energy to electrical energy.
3. An electric circuit is a continuous path through which electric current can flow.
4. Electric current is a vector quantity.
5. Conductivity is the reciprocal of resistivity.
6. The algebraic sum of currents at any junction is zero.
7. The resistance of a thin wire is less than a thick wire of the same length and material.

Choose the correct answer

1. When voltage of 20V is applied across a wire, a current of 0.05A flows through it. The resistance of the wire is

   (i) 405Ω

   (ii) 400Ω

   (iii) 10Ω

(iv) $2.5x10^2$ Ω

2. A voltmeter is used to measure

   (i) Electric current

   (ii) Potential difference

   (iii) Resistance

   (iv) Magnetic field

3. Commercial unit of electric energy is

   (i) Horse power

   (ii) Kilowatt -hour

   (iii) Joule

   (iv) Ampere -second.

Answer the following questions

1. Distinguish between primary cell and secondary cell.
2. Obtain an expression to calculate the equivalent resistance when a number of resistances are connected in parallel.
3. State Ohm's law and hence define resistance.
4. What do you understand by the term internal resistance of a cell?
5. A current of 1.5 amp passes through a wire. Find the total charge that will pass in 20 sec.
6. What is a secondary cell? Give an example.
7. Three resistances each of value 3Ω are connected in parallel and the whole combination is connected across a 18 volt battery. Find the current through each resistance.
8. What is the reciprocal of resistance?
9. Define resistance. Give its unit. What is the effect of temperature on resistance of a conductor?
10. A battery of e.m.f 12 volts is connected in series with a parallel combination of three resistances 2 Ohm, 4 Ohm and 5 Ohm respectively. Calculate the current through each resistor.
11. A wire of length 1m and radius 0.1 mm has a resistance of 100 ohm. Find the resistivity of the material.
12. A heating coil is designed to consume 1000 watts when connected to a 250 volts supply mains. Find the resistance of the coil.
13. State Kirchhoff's laws.
14. The specific resistance of copper wire is $1.7x10^{\wedge-8}$ ohm-cm, the radius of the wire is 1mm. Calculate the length of wire needed for having a resistance of 10.5 ohm

Chapter 7: Electromagnetism

Fill in the blanks

1. In Fleming's right hand rule, the middle finger shows the direction of _____.
2. Magnetic effect of current was discovered by _____.

True or False

1. The direction of induced emf is obtained from Ohm's law.

Choose the correct answer

1. What is electromagnetic induction?

   (i) The process of charging a body

   (ii) The process of rotating a coil of an electric motor

   (iii) Producing induced current in a coil due to relative motion between a magnet and the coil

   (iv) The process of generating magnetic field due to a current passing through a coil.

2. Lenz's law gives us the
   (i) force on the coil

   (ii) the amount of induced emf

   (iii) motion of the coil

   (iv) the direction of induced emf.

3. Iron is used as a core in transformers since it has

   (i) high density

   (ii) high permeability

   (iii) strong enough

   (iv) All of the above

Answer the following questions

1. State and explain Faraday's law of electromagnetic induction.
2. Explain electromagnetic induction. State Lenz's law.
3. What is a transformer? Explain the working of a step up transformer.
4. Define Lenz's law and explain it. State the unit of self induction.
5. State Joule's law of heating.
6. What is a transformer? What are the types of a transformer? Write one use of each type of transformer.
7. 1000 watt power is supplied to 200 turn primary of a transformer at 500mA. The secondary gives 220 volt. Find the numbers of turns in the secondary.
8. Explain the working of a step up transformer.

Chapter 8: Electronics and Semiconductor

Fill in the blanks

1. P type germanium is obtained by doping pure germanium with elements like _____.
2. The diode is called a valve because of its _____ characteristics.
3. In a diode anode is used to _____ thermoelectrons.
4. _____ are the majority charge carriers in an N type semiconductor.
5. At absolute temperature, a semiconductor behaves like _____.
6. Pure semiconductors are also known as _____.
7. _____ are the minority carriers in p-type semiconductors.

True or False

1. A diode can be used as rectifier.
2. P-type germanium is obtained by doping pure germanium with elements like aluminium.
3. Holes are majority charge carriers in p-type semiconductors.
4. For full wave rectification the minimum number of diodes used is three (3).
5. Semiconductors, both P-type and N-type are produced by covalent solids.
6. Ge is an n-type semiconductor.
7. Electric conductivity of extrinsic semiconductor is very low.

Choose the correct answer

1. A rectifier converts

   (i) AC to DC

   (ii) DC to AC

   (iii) low voltage to high voltage

   (iv) ammeter to voltmeter

2. In an N type semiconductor majority charge carriers are

   (i) holes

   (ii) electrons

   (iii) positrons

   (iv) electron-hole pair.

3. A hole in a P-type semiconductor is

   (i) An excess electron

   (ii) A missing electron

   (iii) A missing atom

   (iv) A missing proton.

Answer the following questions

1. State P-type and N-type semiconductor with at least one example of each.
2. What is a semi-conductor? How N-type and P-type semi-conductors are prepared?
3. What is LED? Explain its working principle.

4. Differentiate between intrinsic and extrinsic semiconductor.
5. What is thermionic emission?
6. Explain the formation of a P-type semiconductor.
7. What is an extrinsic semiconductor? What is forbidden energy gap? An LED is constructed from a PN junction based on a certain semi-conducting material whose energy gap is 1.9 eV. Calculate the wavelength of emitted light.
8. Explain the use of p-n junction diode as a half-wave rectifier.
9. Write three differences between p-type and n-type semiconductors. Explain the formation of energy bands in solids.
10. Explain the working of a full wave rectifier.