

- (a) Mesons (b) Baryons (c) Leptons (d) Hadrons
280. A proton consists of quarks which are:  
 (a) Two up, one down (b) One up, two down  
 (c) All up (d) All down
281. The building blocks of protons and neutrons are called:  
 (a) Muons (b) Mesons (c) Protons (d) Neutrons
282. Which pair belongs to hadrons?  
 (a) Protons and Neutrons (b) Neutrons and electrons  
 (c) Photons and electrons (d) Positrons and electrons

## SUBJECTIVE PART

### SECTION-I

#### SHORT QUESTIONS (SQs)

- Define Coulomb's law, write its mathematical formula?
- Describe five/four properties of electric field lines.
- Define xerography and photoconductor?
- Distinguish between conductor and photo conductor.
- Define electric flux, Gaussian surface.
- State and write formula of Gauss's law.
- Define Gaussian surface and electric lines of force.
- Show that  $1N/C=1V/m$
- Define potential gradient. Give its unit.
- What is meant by EEG and ERG?
- Define electric potential with unit.
- Differentiate between electric potential difference and electric potential at a point.
- Convert 1 joule electron volt.
- Write two similarities and dissimilarities among electric force and gravitational force?
- Define Capacitor and Farad.
- Define capacitance and electric polarization.
- What is the effect of polarization on the capacitance of a capacitor?
- What is time constant of a capacitor-resistance circuit and prove that  $R.C$ =time constant.
- Define time constant for RC circuit also draw  $(q-t)$  graph for charging capacitor in RC circuit.
- The potential is constant throughout a given region of space. Is the electric field zero or non-zero in this region? Explain.
- How can you identify that which plate of a capacitor is positively charged?
- Electric lines of force never cross. Why?
- Is  $E$  necessarily zero inside a charged rubber if balloon is spherical? Assume that charge is distributed uniformly over the surface? Explain.
- Do electrons tend to go to region of high potential or of low potential?
- A particle carrying a charge of  $2e$  falls through a potential difference of  $3.0V$ . Calculate the energy acquired by it.
- Define Tesla. Write its mathematical formula.
- Define magnetic flux and its units.
- Distinguish between magnetic flux and magnetic flux density. Write their SI units.

29. State Ampere's law and write it in mathematical form.
30. Why is  $\vec{B}$  non-zero outside a solenoid?
31. Write two uses of CRO (cathode ray oscilloscope).
32. What is cathode ray oscilloscope and galvanometer?
33. What is function of Sweep generator in cathode ray oscilloscope?
34. How can you explain the wave form of various voltage formed in CRO?
35. What is the function of grid in a cathode ray oscilloscope?
36. A current rectangular coil is rotating in a magnetic field. What factor does the torque of coil depend?
37. Define galvanometer. Write its principle.
38. Define current sensitivity of a galvanometer.
39. Distinguish between sensitive and dead beat galvanometers.
40. What modifications are required convert a galvanometer into ammeter?
41. How can you convert a galvanometer into voltmeter?
42. Define AVO meter and Ohm meter.
43. What is digital multi meter? Give its two advantages over AVO meter.
44. Suppose that a charge "q" is moving a uniform magnetic field with a velocity "v". Why is there no work done by the magnetic force that acts on the charge "q"?
45. If a charged particle moves in a straight line through some region of space can you say that magnetic field in the region is zero or non zero?
46. Why does the picture on a T.V screen become distorted when a magnet is brought near the screen?
47. Is it possible to orient a current loop in a uniform magnetic field such that the loop will not tend to rotate? Explain.
48. How can a current loop be used to determine the presence of a magnetic field in a given region of space?
49. How can you use a magnetic field to separate isotopes of chemical element?
50. Why the resistance of an ammeter should be very low?
51. Why a voltmeter should have very high resistance.
52. Differentiate between mass defect and binding energy.
53. Define decay constant and write its unit.
54. Define radioactivity and half life.
55. Why Geiger counter is not suitable for fast counting?
56. Define fission and fusion reaction.
57. Differentiate between controlled and un-controlled chain reaction.
58. State the advantages and disadvantages of fusion power from the point of safety pollution and resources.
59. What is meant by absorbed dose, also write down the units of absorbed dose?
60. Write a short note on basic forces of nature.
61. What are baryons and mesons? How they are formed?
62. What are Hadrons and Leptons. Explain with examples.
63. Why are heavy nuclei unstable? Explain.
64. If a nuclei has life of 1 year, does this mean that it will completely decay after 2 years? Explain.
65. What fraction of radioactive sample decays after two half lives has elapsed?
66. A particle which produces more ionization is less penetrating. Why?
67. What information is revealed by the length and shape of the tracks of an incident particle in Wilson cloud chamber?
68. What do you mean by the term critical mass?
69. What factors make a fusion reaction difficult to achieve?

70. What do you understand background radiations? State two sources.
71. If someone accidentally swallows an alpha source and Beta source. Which would be the more dangerous to him? Explain why?
72. What is radioactive trace? Describe one application in each case of medicine and agriculture.

**SECTION - I**  
**SHORT QUESTIONS (SQs)**

1. Define conventional current and electronic current.
2. How the heating effect produced when current flows through the conductor.
3. Define Ohm's Law. Also define ohmic and non ohmic devices.
4. A wire of length 10m has resistance  $100\Omega$ . If the wire is stretched to increase its length three times what will be its new resistance.
5. Define temperature coefficient of resistance. Give its units.
6. Differentiate between resistance and resistivity.
7. What is meant by tolerance? Find the resistance of a resistor with red, green, orange and fourth and gold respectively band.
8. What are thermistor? How are they made?
9. How is rheostat used as potential divider?
10. Under what conditions emf of a cell and terminal potential difference become equal?
11. State Kirchhoff's rule.
12. A potential difference is applied across the ends of a copper wire. What is the effect on the drift velocity of free electrons by:
  - a) increasing the potential difference
  - b) Decreasing the length and temperature of the wire?
13. Why does the resistance of a conductor rise with temperature?
14. Is the filament resistance lower or higher in a 500W, 220V light bulb than in 100W, 220V bulb?
15. Explain why the terminal potential difference of battery decreases when the current drawn from it is increased?
16. What is Wheatstone bridge? How can it be used to determine an unknown resistance?
17. Define peak value and peak to peak value of A.C voltage?
18. What do you mean by phase lag and phase lead?
19. What is difference between A.C circuit and D.C circuit?
20. What is meant by inductive and capacitive reactance?
21. Define impedance and write the impedance expression for R-L series circuit.
22. In R-C series circuit will the current lag or lead the voltage. Illustrate your answer with diagram.
23. Explain power factor.
24. Write two properties of R-L-C series circuit.
25. Write two/four properties of parallel resonance circuit.
26. Write some/main advantages of three phase A.C supply.
27. Define A.C and choke.
28. Write down advantages and disadvantages of A.M and F.M.
29. Define modulation and write names of its types.
30. How many times per second will an incandescent lamp reach maximum brilliance when connected to a 50 Hz source?
31. How does doubling the frequency affect the reactance.
  - (a) an inductor
  - (b) a capacitor

32. In R-L circuit, will the current lag or lead the voltage? Illustrate your answer by a vector diagram.
33. Explain the condition under which electromagnetic waves are produced from a source.
34. How is the reception of a particular radio station selected on your radio set?
35. At what frequency will an inductor of inductance  $1.0 \text{ mH}$  have a reactance of  $500 \Omega$ ?
36. Define unit cell and crystal lattice.
37. Define tensile stress and volumetric stress?
38. What is the difference between ductile and brittle substance?
39. Explain briefly the insulator on the basis of energy band theory.
40. Define (a) Conduction band (b) Valence band
41. Describe energy band picture of semi-conductors.
42. Differentiate between insulators and conductors.
43. Distinguish between soft magnetic materials and hard magnetic materials.
44. Define saturation and Remanence of Hysteresis loop.
45. Distinguish between crystalline, amorphous and polymeric solids.
46. Define modulus of elasticity. Show that units of modulus of elasticity and stress are the same. Also discuss its three types.
47. What is meant by strain energy? How can it be determined from the force-extension graph?
48. Distinguish between intrinsic and extrinsic semi-conductors?
49. What is meant by para, dia and ferromagnetic substances? Give example for each.
50. Define depletion region and potential barrier.
51. How will you obtain N-type and P-type material from pure silicon?
52. What is potential barrier of germanium and silicon? Also define potential barrier.
53. Define rectification. Draw a circuit diagram of half wave rectifier.
54. What is photodiode? Write down its any two applications?
55. What is LED? Write its operation.
56. What do you know about photo-voltaic cell?
57. Define " $\beta$ " for transistor. Also write its fundamental current equation.
58. Define open loop gain of an operational amplifier. Also give its formula.
59. Name three basic characteristics of Op-Amp. Also give their approximate values.
60. Write briefly about operational amplifier.
61. Define digital system and logic gate.
62. What is the mathematical expression of And gate? Write its truth table.
63. What is OR-GATE? Write its relation.
64. Write down the logic expression and logic table for exclusive NOR gate.
65. Draw the symbol and truth table of NAND gate.
66. Give two applications of gates in control system.
67. How does the motion of an electron in an n-type differ from the motion of holes in a p-type substance?
68. What is net charge on N-type and P-type substances? Justify the answer.
69. The anode of a diode is  $0.2 \text{ V}$  positive with respect to its cathode. Is it forward biased?
70. Why charge carriers are not present in depletion region?
71. What is the effect of forward and reverse biasing of a diode on the width of depletion region?
72. Why ordinary silicon diodes do not emit light?
73. Why a photo diode is operated in reverse biased state?
74. Why is the base current in a transistor very small?
75. What is the principle of virtual ground? Apply it to find the gain of an inverting amplifier.

**SECTION-III****SHORT QUESTIONS (SOs)**

1. Define induced emf and induced current:
2. Write down two methods for determining the induced emf in a loop
3. How the induced current can be increased?
4. What is motional emf? State the factors it depend upon.
5. State Faraday's law of electromagnetic and write its mathematical expression.
6. Define write hand rule for determining the direction of the magnetic field.
7. Verify that an ohm times faraday is equivalent to second.
8. State Faraday's law of electromagnetic induction.
9. Define lenz s law does it agree with the law of conservation of energy?
10. Define mutual induction. On what factors does mutual inductance of the two coil depend?
11. Name the factors upon which the self -inductance of coil depends?
12. Define self induction and self inductance.
13. What is differences between motor and generator?
14. How fluctuations of the output can be reduced in D.C generator?
15. Write a note on back motor effect in generator?
16. Define back emf effect in motor. Also tell what happens when is over loaded?
17. Define step-up and step down transformers.
18. Give the two techniques to improve the efficiency of transformer.
19. How the power losses can be minimized in a transformer?
20. Does the induced emf in a circuit depend on the resistance of the circuit? Does the induced current depend as the resistance of the circuit?
21. Does the induced emf always act to decrease the magnetic flux through a circuit? Explain.
22. How would you position a flat loop of wire in a changing magnetic field so that there is no emf induced in the loop?
23. In a certain region the earth's magnetic field point vertically down, when a plane flies due to north, which wingtip is positive charged?
24. Show that emf  $\varepsilon$  and  $\frac{\Delta\phi}{\Delta t}$  have the same units.
25. Can a D.C motor be turned into a DC generator?
26. Is it possible to change both the area of the loop and the magnetic field passing through the loop and still not have induced emf in the loop?
27. Four unmarked wires energy from a transformer. What steps would you to determine turn ratio?
28. Can a step-up transformer increase the power level? Explain/Comment.
29. In a transformer, there is no transfer of charge from the primary to the secondary. How is then the power transferred?
30. When the primary of a transformer is converted to A.C current in it.
31. Distinguish between inertial frame of reference and non-inertial frame of reference.
32. Write down the postulates of special theory of relativity.
33. Distinguish between general theory relativity and special theory of relativity?
34. Explain NAVSTAR Navigation system.
35. What are black body radiation? How can you get a black body?
36. Define stopping potential and threshold frequency.
37. Define Compton effect. Write the formula of Compton shift for scattering angle.
38. Define photoelectric effect and pair production.
39. What is wave particle duality? Give its one practical use?

40. State uncertainty principle. Give its two mathematical forms.
41. What are the measurements on which two observers in relative motion will always agree upon?
42. If the speed of light were infinite, what would be the equations of special theory of special theory of relativity reduce to?
43. As a solid is heated, it begins to glow? Why does it first appear red?
44. What happens to total radiation from a black body if its absolute temperature is doubled?
45. Which photon red, green or blue carries the most:  
(a) Energy (b) Momentum
46. Which has the lower energy quanta? Radio waves or X-rays?
47. Will bright light eject more electrons from a metal surface than dimmer light of the same colour?
48. When light shines on a surface, is momentum transferred to the metal surface?
49. Why don't we observe a Compton effect with visible light?
50. Can pair production take place in vacuum? Explain.
51. Is it possible to create a single electron from energy? Explain.
52. If an electron and a proton have the same De-Broglie wavelength, which particle has greater speed?
53. We do not notice the de Broglie wavelength for a pitched cricket ball. Explain why?
54. When does light behave as a wave? When does it behave as a particle?
55. Define spectroscopy, holography.
56. Define Continuous spectra and line spectra.
57. State postulates of Bohr's model of hydrogen atom.
58. What do we mean when we say that the atom is excited?
59. Define excitation energy and ionization energy.
60. What is meant by CAT-Scanner?
61. Write two properties and two uses of X-rays.
62. What is meant by normal population and population inversion?
63. Write down four uses of laser.
64. Distinguish between stimulated emission and spontaneous emission.
65. What is meant by line spectrum. Example how line spectrum can be used for identification of elements?
66. Can an electron in the ground state of hydrogen atom absorb a photon of energy 13 eV or greater than 13.6eV?
67. How can the spectrum of hydrogen contains many lines when hydrogen contains one electron?
68. Is energy conserved when a atom emits a photon of light? Explain.
69. Can X-ray be reflected, refracted, diffracted and polarized just like any other wave? Explain.
70. What are the advantages of laser over ordinary light?
71. Explain why laser action could not occur without population inversion between atomic levels?

## LONG QUESTIONS

### LONG QUESTION NO. 5

#### QUESTIONS

- ❖ State and explain Coulomb's Law.