SECTION - A\*\*

\*\*Q.1.\*\* Select and write the correct answer for the following multiple choice type of questions: \*\*[10]\*\*

(i) The ratio of the emissive power of a perfectly blackbody at 1327°C and 527°C is \_\_\_\_\_\_\_. (Ch.3)

(a) 4 : 1

(b) 16 : 1

(c) 2 : 1

(d) 8 : 1

(ii) The wavelength range of thermal radiation is \_\_\_\_\_\_\_. (Ch.3)

(a) from 400 Å to 7000 Å

(b) from 7700 Å to 4 × 10⁵ Å

(c) from 10⁶ Å to 10⁸ Å

(d) from 4 × 10⁻¹² Å to 4 × 10⁸ Å

(iii) Atom bombs or nuclear devices employ \_\_\_\_\_\_\_. (Ch.15)

(a) nuclear fission only

(b) nuclear fusion only

(c) nuclear fusion alone as well as combination of both nuclear fission and fusion

(d) nuclear fission alone as well as combination of both nuclear fission and fusion

(iv) A voltmeter has a resistance 30 Ω. What will be its reading, when it is connected across a cell of emf 2V having internal resistance 10 Ω? (Ch.9)

(a) 1.5 V

(b) 2.0 V

(c) 2.5 V

(d) 3.0 V

(v) The output of a step-down transformer is measured to be 24 V when connected to a 12 watt light bulb. The value of the peak current is \_\_\_\_\_\_\_. (Ch.13)

(a) 2√2 A

(b) 2 A

(c) √2 A

(d) 1/√2 A

(vi) According to right hand thumb rule, the direction of magnetic induction if current is directed in anticlockwise direction is \_\_\_\_\_\_\_. (Ch.10)

(a) perpendicular and inwards

(b) same as current

(c) perpendicular and outwards

(d) opposite to that of current

(vii) Eddy currents are produced in a conductor when magnetic field is subjected to \_\_\_\_\_\_\_. (Ch.12)

(a) varying magnetic field

(b) constant magnetic field

(c) no magnetic field

(d) specific value of magnetic field

(viii) When a longitudinal wave is incident at the boundary of a denser medium, then (Ch.6)

(a) a compression reflects as a compression

(b) a compression reflects as a rarefaction

(c) a rarefaction reflects as a compression

(d) a longitudinal wave reflects as a transverse wave

(ix) The values of coefficient of performance (β) and efficiency (η) of refrigerator are

(a) β > 1, η = 1

(b) β > 1, η = 2

(c) β < 1, η = 1.5

(d) β < 1, η = 1

(x) Which of the following phenomena proves that light is a transverse wave? (Ch.1)

(a) Reflection

(b) Diffraction

(c) Polarization

(d) Interference

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\*\*Q.2.\*\* Answer the following questions:

(i) State the dimensions and SI unit of electric polarization. (Ch.8)

(ii) Why are alkali metals most suitable as photosensitive surfaces? (Ch.14)

(iii) Give an example of some familiar process in which heat is added to an object, without changing its temperature. (Ch.11)

(iv) In a common base connection, a certain transistor has an emitter current of 10 mA and collector current of 9.8 mA. Calculate the value of the base current. (Ch.16)

(v) If the displacement of a particle in SHM is given by x = 0.1 cos (100 t) m. What is the maximum speed of the particle? (Ch.5)

(vi) Draw a graph showing the variation of magnetic susceptibility of a ferromagnetic material with temperature. (Ch.12)

(vii) What is fresnal diffraction? (Ch.7)

(viii) Explain why the inductance of two coils connected in parallel is less than the inductance of either coil. (Ch.12)

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\*\*SECTION - B\*\*

Attempt any EIGHT of the following questions:

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\*\*SECTION - C\*\*

Attempt any EIGHT of the following:

\*\*Q.15.\*\* Two parallel SHMs are given by x₁ = 10 sin 8πt + π/6 m and x₂ = 20 sin 8πt m

Find the resultant amplitude and phase of SHM. (Ch.5)

\*\*Q.16.\*\* Write a short note on

(i) Full wave Rectifier (ii) Ripple factor (iii) Rectification (Ch.16)

\*\*Q.17.\*\* Calculate the amount of energy evolved when 343 droplets of mercury each of radius 0.05 mm, combine to form one drop. The surface tension of mercury is 50 × 10⁻³ N/m. (Ch.2)

\*\*Q.18.\*\* Explain formation of clouds at high altitude. (Ch.4)

\*\*Q.19.\*\* Explain the Domain theory in brief. (Ch.11)

\*\*Q.20.\*\* Draw a neat labelled diagram of

(i) Polarization of light

(ii) Unpolarized light passing through two polarizers

(iii) Polarization by reflection (Ch.7)

\*\*Q.21.\*\* Assuming that the temperature at the surface of the sun is 6000 K, find out the size of a virtual star (in terms of the size of Sun) whose surface temperature is 3000 K and the power radiated by the virtual star is 25 times the power radiated by the sun. Treat both the sun and virtual star as a blackbody. (Ch.3)

\*\*Q.22.\*\* What is a rejector circuit? State its uses. (Ch.13)

\*\*Q.23.\*\* Obtain an expression for potential energy of a system of N point charges. (Ch.8)

\*\*Q.24.\*\* The self-inductance of a closely wound coil of 200 turns is 10 mH. Determine the value of magnetic flux through the cross-section of the coil when the current passing through the coil is 4 mA. (Ch.12)

\*\*Q.25.\*\* In nuclear reactors, neutrons travel with energies of 5 × 10⁻²¹ J. Find their speed and wavelength. (Ch.14)

\*\*Q.26.\*\* Write a short note on Helical motion (Ch.10)

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\*\*SECTION - D\*\*

Attempt any THREE of the following:

\*\*Q.27.\*\* With the help of a neat labelled diagram, obtain an expression for the induced emf in a stationary coil in a changing magnetic field. (Ch.12)

\*\*Q.28.\*\* Explain the construction and working of sonometer hence explain its use to verify laws of vibration. (Any one) (Ch.5)

\*\*Q.29.\*\* Define: (a) Nucleous (b) Isotopes (c) Isobars (d) Isotones

If the electron in a hydrogen atom stays in the second stable orbit for 10 ns, how many revolutions around the nucleus does it make in that time? (Ch.15)

\*\*Q.30.\*\* What is a post office box? How is the unknown resistance measured using PO box?

In the given Wheatstone’s network, what should be the value of P in terms of R for the bridge to be balanced? (Ch.9)

Q.31.A spring breaks under tension of 10 kg wt. If the string is used to revolve a body of mass 1.2 kg in a horizontal circle of radius 50 cm, what is the maximum speed with which the body can be revolved? Discuss the necessity of radius of gyration with their definition.