PROVISIONAL ANSWER KEY
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Note - Candidate must ensure the compliance to send all suggestion in the given format with reference to this paper with provisional answer key only

202. The ground state of Chlorine is $^2P_{3/2}$ then its magnetic moment is

(A) $\frac{3}{2}\mu_B$ (B) $\frac{4}{3}\mu_B$

(C) μ_B (D) $\frac{4}{3}\sqrt{15}\mu_B$

203. The magnetic moment for ^{19}F nucleus is 2.6273 μ_N and nuclear spin quantum number $I = \frac{1}{2}$, the nuclear g_N -factor

(A) 8.0169 (B) 5.2546

(C) 2.6276 (D) 1.3136

204. The co-ordination number and packing fraction of fcc structure respectively are

(A) 12 and 0.74 (B) 8 and 0.74

(C) 8 and 0.68 (D) 6 and 0.52

205. If the interatomic distance in NaCl crystal is 0.30 nm, the lattice parameter is

(A) 0.15 nm (B) 0.30 nm

(C) 0.45 nm (D) 0.65 nm

206. A lattice is characterized by following primitive vectors $\vec{a} = \frac{a}{2}(\hat{j} + \hat{k} - \hat{i})$, $\vec{b} = \frac{a}{2}(\hat{k} + \hat{i} - \hat{j}), c = \frac{a}{2}(\hat{i} + \hat{j} - \hat{k})$. The corresponding reciprocal lattice is

(A) bcc with cube edge $\frac{2\pi}{a}$ (B) bcc with cube edge $\frac{1}{a}$

(C) fcc with cube edge $\frac{2\pi}{a}$ (D) fcc with cube edge $\frac{1}{a}$

207. If $\vec{k}$ is wave vector of incident x-ray and $\vec{G}$ is reciprocal lattice vector, the condition of Bragg's reflection is given by

(A) $\vec{k} = \vec{G}$ (B) $\vec{k} = -\vec{G}$

(C) $|\vec{k}| = |\vec{G}|$ (D) $2\vec{k} \cdot \vec{G} = G^2$

208. If $p(r)$ is electron density function, $p(r)\,dV$ is electron charge, $\varphi(r)$ is the phase difference then the atomic form factor f can be given by

(A) $f = \int e^{i\varphi(r)}\, p(r)\, dV$ (B) $f = \int e^{-i\varphi(r)}\, p(r)\, dV$

(C) $f = \int e^{ip(r)}\, \varphi(r)\, dV$ (D) $f = \int e^{i\varphi(r)}\, [p(r)]^2\, dV$

209. For body centered cubic crystals, the geometrical structure factor S is

(A) 0 for all values of $(h+k+l)$

(B) 2 for all values of $(h+k+l)$

(C) 0 for all odd values of $(h+k+l)$ and 2 for all even values of $(h+k+l)$

(D) 0 for all even values of $(h+k+l)$ and 2 for all odd values of $(h+k+l)$

210. If total potential energy of interaction between two atoms of a molecule is given by $U(r) = -\frac{A}{r^m} + \frac{B}{r^n}$, and exhibit minima at $r = R_0$, then R_0 is given by

(A) $\left(\frac{Bn}{Am}\right)$

(B) $\left(\frac{Bn}{Am}\right)^{\frac{1}{m-n}}$

(C) $\left(\frac{An}{Bm}\right)^{\frac{1}{n-m}}$

(D) $\left(\frac{Bn}{Am}\right)^{\frac{1}{n-m}}$

211. 1 eV per mole is approximately equal to

(A) 2.3 k Cal mol^{-1}

(B) 1.6 k Cal mol^{-1}

(C) 23 k Cal mol^{-1}

(D) 23 Cal mol^{-1}

212. In the vibrations of one dimensional monoatomic lattice, if the angular frequency is between zero and maximum value, then the lattice behaves like

(A) Superconductor

(B) Low- pass filter

(C) High –pass filter

(D) Perfect diamagnetic material

213. According to the Dulong and Petit's law, the heat capacity of a solid consisting of N atoms at high temperatures, is (k_B is Boltzmann constant)

(A) $\frac{1}{2}Nk_B$

(B) $\frac{3}{2}Nk_B$

(C) Nk_B

(D) $3Nk_B$

214. Which of the following represents the Fermi function, where all the symbols assume their usual meanings

(A) $f(E) = \frac{1}{\exp\left(\frac{E+E_F}{k_B T}\right)+1}$

(B) $f(E) = \frac{1}{\exp\left(\frac{E-E_F}{k_B T}\right)+1}$

(C) $f(E) = \frac{1}{\exp\left(\frac{E-E_F}{k_B T}\right)-1}$

(D) $f(E) = \frac{1}{\exp\left(\frac{E+E_F}{k_B T}\right)-1}$

215. According to Wiedemann-Franz law, at constant temperature, for metals, the ratio of

(A) The electrical resistivity to the thermal conductivity should be constant

(B) The thermal conductivity to the electrical resistivity should be constant

(C) The electrical current to the thermal conductivity should be constant

(D) The electrical conductivity to the thermal conductivity should be constant

216. According to free electron theory, the Lorenz number of a metal is (symbols have their usual meaning),

(A) $\frac{\pi^2}{3}\left(\frac{k_B}{e}\right)^2$ (B) $\frac{\pi^2}{5}\left(\frac{k_B}{e}\right)^3$

(C) $\frac{\pi^2}{5}\left(\frac{k_B}{e}\right)^2$ (D) $\frac{\pi^5}{3}\left(\frac{k_B}{e}\right)^2$

217. The SI unit of Hall coefficient is

(A) V $m^2A^{-1}Wb^{-3}$ (B) V $m^3A^{-1}Wb^{-1}$

(C) V $m^3A^{-1}Wb^{-3}$ (D) V $m^3A^{-2}Wb^{-3}$

218. The critical temperature of superconductor is 3.7 K in absence of applied magnetic field and its critical magnetic field is 0.0306 T (T stands for Tesla) at absolute zero. Its critical magnetic field at 2 K is

(A) 1.16×10^{-3} T (B) 1.16×10^{-2} T

(C) 2.16×10^{-2} T (D) 2.16×10^{-3} T

219. The magnetic susceptibility of a material in superconducting state is

(A) -1 (B) 0

(C) 1 (D) ∞

220. The spins of electron, proton, and neutron respectively are

(A) $\frac{1}{2},\frac{1}{2},\frac{1}{2}$ (B) $\frac{1}{2},\frac{1}{2},\frac{3}{2}$

(C) $\frac{1}{2},\frac{3}{2},\frac{1}{2}$ (D) $\frac{1}{2},\frac{3}{2},\frac{3}{2}$

221. The nuclear radius of ^{40}Ca is approximately

(A) 6.3 Fermi (B) 5.2 Fermi

(C) 4.1 Fermi (D) 3.0 Fermi

222. According to semi-empirical mass formula, if A is atomic mass number, the surface effect correction term to the total binding energy is proportional to

(A) $A^{\frac{1}{2}}$ (B) $A^{\frac{1}{3}}$

(C) $A^{\frac{2}{3}}$ (D) $A^{\frac{2}{5}}$

223. If the masses of proton, neutron and deuteron are respectively 938.256 MeV, 939.550 MeV and 1875.5803 MeV, then the binding energy of deuteron is approximately equal to

(A) 1.875 MeV (B) 2.875 MeV

(C) 3.753 MeV (D) 2.2260 MeV

224. The ratio of gravitational force to Coulomb attractive force between two protons in the nucleus is in order of

(A) 10^{-28} (B) 10^{-32}

(C) 10^{-36} (D) 10^{-40}

225. The nuclear magic numbers are

(A) 2, 8, 20, 28, 50, 80 and 126

(B) 2, 8, 20, 28, 50, 82 and 126

(C) 2, 8, 20, 26, 50, 80 and 126

(D) 2, 8, 20, 26, 50, 80 and 126

226. There is a parity selection rule for α-decay that depends on

(A) Angular momentum (B) Linear momentum

(C) Kinetic energy (D) Position

227. The electrostatic force between earth and moon can be ignored

(A) Because it is much smaller than the gravitational force

(B) Because the bodies are electrically neutral

(C) Because they are far away from each other

(D) Because of the tidal effect

228. A particle and its antiparticle

(A) must have the same mass

(B) must be different from each other

(C) must have same angular momentum

(D) can always annihilates into two photons

229. The selection rule for single electric –dipole transition are

(A) $\Delta l = 0, \pm 1 ; \Delta j = 0, \pm 1$ (B) $\Delta l = \pm 1 ; \Delta j = 0, \pm 1$

(C) $\Delta l = \pm 2 ; \Delta j = 0, \pm 1$ (D) $\Delta l = \pm 1 ; \Delta j = \pm 1$

230. What is at the root of quantization of energy in quantum physics?

(A) Planck's hypotheis

(B) Theory of relativity

(C) Bounary condition on wave function

(D) none of above

231. The quantum state of an electron in an atom is determined by ..... quantum numbers.

(A) One (B) Two

(C) Three (D) Four

232. The concept of spin of electron was introduced to explain the

(A) Doublet structure of spectral lines of alkali metals

(B) Doublet structure of spectral lines of transition elements

(C) Multiplet structure of spectral lines of alkaline earth elements

(D) The course structure of spectral lines of the elements in periodic table

233. Fraunhoffer lines are observed in the spectrum of

(A) A hydrogen discharge tube

(B) A carbon ax

(C) The sun

(D) Sodium vapour lamp

234. A piece of copper and another of germanium are cooled from room temperature to 40 K. The resistance of

(A) Each of them increases

(B) Copper increases and germanium decreases

(C) Copper decreases and germanium increases

(D) Each of them decreases

235. The equivalent quantity of mass in electricity is

(A) Current (B) Self inductance

(C) Potential (D) Change

236. What changes on polarization of light?

(A) Intensity (B) Phase

(C) Frequency (D) Wave length

237. Neutrino is a particle which

(A) Has no charge but has spin

(B) Is charged like electron and has spin

(C) Has no charge but has mass nearly that of electron

(D) Has no charge and no spin

238. Which of the following cannot be polarized?

(A) Radio waves (B) X-rays

(C) Ultra-sonic waves (D) Ultra-violet rays

239. The frequency of audio analog signals lies in the range

(A) 20Hz to MHz (B) 20Hz to 20kHz

(C) 20kHz to 20MHz (D) 12Hz to 20MHz

240. Magnetic field outside a solenoid is

(A) Zero. (B) Strong.

(C) Infinite. (D) Negligible

241. In alpha decay (α-decay) proton number of parent nuclide

(A) Increases by 2 (B) Increases by 1

(C) Decreases by 2 (D) Decreases by 4

242. Nuclear sizes are expressed in a unit named

(A) Fermi (B) Angstrom

(C) Newton (D) Tesla

243. Which quantity remains same in isotones

(A) Number of protons (B) Number of neutrons

(C) Mass number (D) All of the above

244. If δQ is the heat transferred to the system and δW is the work done by the system, then which of the following is an exact differential

(A) δQ (B) δW

(C) $\delta Q + \delta W$ (D) $\delta Q - \delta W$