S.S.R. DEGREE COLLEGE, (AUTONOMOUS) NIZAMABAD

II SEMESTER INTERNAL ASSESSMENT II EXAMINATIONS

PHYSICS (THERMAL PHYSICS) QUESTION BANK

I. Fill in the blanks.

1. The quantum theory of radiation was proposed by max planck
2. A perfectly black body absorbs all the radiations of any wavelength which falls on it.
3. The expression for maximum value of emissive power E_λ is obtained by equating $\frac{\partial E_\lambda}{\partial \lambda}$ to zero
4. The oscillator or resonator cannot have an arbitrary amount of energy but can be in one of the discrete energy level which is given by E_n = nhv
5. A pyrometer is a type of remote sensing thermometer used to measure the temperature of a surface.
6. The pyrometer which are sensible to the visible electromagnetic spectrum fall under optical pyrometer
7. The common application of total radiation pyrometer is measuring temperature of a
8. The relation derived for the total emissive power of the black body as a function of wavelength and depends upon quantum theory is known as plank's law
9. Stefan's law is used for determining the temperature of the sun's surface.
10. The effective temperature of the Earth is 279K
11. Gibb's introduced the concept of ensemble in statistical mechanics
12. Phase space is a combination of position space and momentum space.
13. The size of the cells in phase space are equal
14. A microstate is a state of the system where all the parameters of the constituents (particles) are specied.
15. For an ideal gas, internal energy is a function of temperature only.
16. Wein's displacement states that, the wavelength at which the radiated power is a maximum for a blackbody varies inversely with the temperature.
17. Stefan's law is applicable only to blackbodies, theoretical surfaces that absorb all incident heat radiation.
18. Thermal probability of a system is defined as, the number of microstates per macrostate.
19. In quantum statistics, the number of cells available in phase space is equal to the number of particles
20. The equation for Fermi-Dirac distribution is $g_i/n_i = \underline{[e^{(\alpha+\beta E_i)}+1]}$

II. Multiple Choice

1. The electromagnetic radiation spectrum emitted by a black body vary continuously in wavelength from _____ [a]

(a) 0 to infinity (b) 0 to 5 (c) 2 to 10 (d) -1 to ∞

2. The average energy of planck's oscillator is given by, $\bar{\varepsilon}$ = _____ [c]

(a) $\frac{hv}{e^{hv/kT}+1}$ (b) $\frac{hv}{e^{-hv/kT}-1}$ (c) $\frac{hv}{e^{hv/kT}-1}$ (d) $e^{hv/kT}$

3. The change in oscillator energy is given by Δ E = _____ [a]

(a) hv (b) nhv (c) $e^{-hv/kT}$ (d) $\frac{hv}{kT}$

4. Pyrometers used depending upon the wavelength range are, [b]

(a) Optical and total radiation (b) Optical and radiation

(c) Radiation and total radiation (d) Total radiation and fiber optic

5. _____ pyrometer is used for measuring temperature of a glowing object [d]

(a) Optical (b) Radiation (c) Fiber optic (d) Disappearing filament

6. The effective temperature of the sun is _____ [a]

(a) 5777K (b) 4758K (c) 6781K (d) 577K

7. The expression for maximum wavelength is given by, λ_m = _____ [c]

(a) T + b (b) $\frac{T}{b}$ (c) $\frac{b}{T}$ (d) T – b

8. The process in which heat from the sun reaches earth is known as [b]

(a) Convection (b) Radiation (c) Conduction (d) All of the above

9. The energy emitted by a black body is known a _____ radiation [a]

(a) Black body (b) Nuclear (c) Thermal (d) None of these

10. According to Rayleigh-Jeans law, the formula for energy distribution is given as, $E_\lambda d\lambda$ = [b]

(a) $\frac{8\pi kT}{\lambda^2}d\lambda$ (b) $\frac{8\pi kT}{\lambda^4}d\lambda$ (c) $\frac{8\pi kT}{\lambda}d\lambda$ (d) $\frac{8\pi kT}{\lambda^3}d\lambda$

11. A state of the system where the distribution of particles over the energy levels is specified is [b]

(a) Microstate (b) Macrostate (c) Particle (d) Phase space

12. In the size of cells in phase space are equal and total number of molecules and energy remains constant. [a]

(a) Statistical mechanics (b) Phase cell

(c) Maxwell-Boltzmann distribution (d) Quantum statistics

13. The expression for Maxwell-Boltzmann's distribution law is given as n_1 = _____ [c]

(a) $g_i e^{-\alpha}$ (b) $e^{-\left(\frac{E_i}{kT}\right)}$ (c) $g_i e^{-\alpha} e^{-\left(\frac{E_i}{kT}\right)}$ (d) $g_i e^{\alpha} e^{\left(\frac{E_i}{kT}\right)}$

14. Bose-Einstein statistics is applicable to particles with [d]

(a) Any spin (b) Old hall (c) Spin (d) Integral spin

15. The particles of the system are identical and indistinguishable in _____statistics. [d]

(a) Maxwell-Boltzan (b) Bose-Einstein (c) Fermi-Dirac (d) Both (a) and (c)

16. _____ law is true in the limitins case of small number of particles per quantum state. [a]

(a) Maxwell-Boltzman (b) Fermi-Dirac distribution

(c) Bose-Einstein (d) Photon's Planck's

17. _____ are used for finding values of thermodynamic quantities in large number of systems [a]

(a) Ensembles (b) Phase cell (c) Phase space (d) Phase point

18. A small very dense star that is typically the size of a planet is known as _____star. [a]

(a) White dwarf (b) Neutron (c) Both (a) and (b) (d) None of these

19. An object or a system that absorbs all the radiations incident on it is _____ [a]

(a) Black body (b) Sun (c) Cell (d) Photon's

20. The SI units of Stefan Boltzmann constant is _____ [d]

(a) WK^{-4} (b) K^{-4} (c) Wm^{-2} (d) $Wm^{-2}\ K^{-4}$

III. Descriptive Questions.

1. Explain the construction and working of disappearing filament optical pyrometer with neat diagram?
2. What is planck's hypothesis? Derive planck's formula for the distribution of energy in blackbody radiation?
3. Define solar constant. Obtain an expression for calculating the temperature of sun with the help of solar constant?
4. Deduce maxwell-Boltzmann velocity distribution for classical particles?
5. State the conditions for the F-D statistics. Derive an expression for the F-D distribution?
6. Give a comparision of Maxwell-Boltzman, Bose-Einstein, Fermi-Dirac statistics.