KATHMANDU UNIVERSITY
End Semester Examination [C]
January, 2018

Marks Scored:

Level : B.Sc.
Year : II

Course : PHYS 212
Semester: II

Exam Roll No. :

Time: 30 mins.

F. M. : 20

Registration No.:

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SECTION "A"
[20 Q. × 1 = 20 marks]

Choose and tick the most appropriate answer. The symbols have their usual meanings.

1. The specific heat capacity of gas
[a] has only two values C_p and C_v [b] has a unique value at a given temperature
[c] can have any value between 0 and ∞ [d] depends upon the mass of the gas

2. An ideal heat engine working between temperatures T_1 and T_2 has efficiency η. If both the temperature are raised by 100 K each,the new efficiency of enginewill be
[a] less than η [b] more than η [c] η [d] 100η

3. The ice berg melts at the base but not at the top because
[a] the base of the iceberg remains in warmer condition
[b] ice at base contains impurities.
[c] due to high pressure, melting point of ice at the base is lowered.
[d] ice at the top is of different kind.

4. Which of the following is not a Maxwell thermoduynamic relation?
[a] $\left(\frac{\partial T}{\partial V}\right)_S = -\left(\frac{\partial P}{\partial S}\right)_V$ [b] $\left(\frac{\partial S}{\partial V}\right)_T = \left(\frac{\partial P}{\partial T}\right)_V$
[c] $\left(\frac{\partial T}{\partial P}\right)_S = \left(\frac{\partial V}{\partial S}\right)_P$ [d] $\left(\frac{\partial S}{\partial P}\right)_T = -\left(\frac{\partial T}{\partial V}\right)_P$

5. The Vander Waal's constant for hydrogen are: $a = 0.247 \text{atm litre}^2\text{mole}^{-2}$ and $b = 2.65\times10^{-2}$ litre mole^{-1}. The temperature of inversion for R=8.2 Joule $\text{mole}^{-1}\text{K}^{-1}$ is equal to
[a] 227.4 K [b] 22.74 K [c] 2.274 K [d] 2274 K

6. Choose the wrong statement from the following:
[a] Joule's expansion always produces a cooling effect.
[b] Joule-Thomson effect is always a cooling effect.
[c] In Joule expansion only internal work is done.
[d] In Joule-Thomson expansion external work is done on the gas as well as by the gas.

7. The closed bottle containing water at 30^0C is carried to the moon in a space ship. If it is placed on the surface of the moon, what will happen to the water as soon as the lid is opened?
[a] the water will freeze [b] water will decompose into H_2 and O_2
[c] the water will boil and escape [d] nothing will happen to it.

8. The second virial coefficient B
[a] varies in a different manner for different gas
[b] is positive at low temperatures
[c] is zero at Boyle temperature
[d] is higher than first virial coefficient

9. The ratio of temperature of inversion to critical temperature is:
[a] $\frac{27}{4}$ [b] $\frac{27}{4}R$ [c] $\frac{3}{8}$ [d] $\frac{3}{8}R$

10. The amount of work that must be done to freez 1gm of water at 0^0C by means of a refrigerator machine if the temperature of the surrounding is 27^0C is equal to
[a] 791 cals [b] 79.1 cals [c] 0.791 cals [d] 7.91 cals

11. In the equilibrium state:
[a] the number of particles is maximum [b] the probability is minimum
[c] β parameters of two systems are different [d] the probability is maximum

12. Five particles are distributed in two phase cells. Then number of macrostates is:
[a] 6 [b] 10 [c] 5/2 [d] 32

13. If the degrees of freedom of gas are 'f', then the ratio of its two specific heats $\frac{C_p}{C_v}$ is given by
[a] $1-\left(\frac{1}{f}\right)$ [b] $1+\left(\frac{1}{f}\right)$ [c] $1+\left(\frac{2}{f}\right)$ [d] $1-\left(\frac{2}{f}\right)$

14. The molecular diameter of nitrogen is 3.5×10^{-8} cm. The mean free path at temperature 20^0C and pressure 1 atmospheric is [Boltzmann constant (k)=1.38×10^{-16} erg per degree K.]
[a] 7.6×10^{-5}cm [b] 7.6×10^{-6}cm [c] 7.6×10^{-5}m [d] 7.6×10^{-6}m

15. Einstein's theory of specific heat assumes that the atoms of a solid vibrates simple harmonically:
[a] all with the same frequency. [b] in many different modes.
[c] in a complex manner. [d] like longitudinal waves.

Fill in the blanks.

16. The spin value of Fermions is .....

17. Debye temperature for diamond is 2230 K. The maximum lattice frequency corresponding to this temperature is .....

18. Among Boson, Fermion and Classical particle, the α-particle ($_2He^4$) is .....

19. Certain substance emits only the wavelengths $\lambda_1, \lambda_2, \lambda_3$ and λ_4 when it is at high temperature. When this substance is at a colder temperature, the wavelengths that it will absorbs are .....

20. The maximum wavelength of radiation emitted at 2000 K is 4 μm. The maximum wavelength of radiation emitted at 2400 K is .....