

B.Sc. Semester - 4 (CBCS) Examination**March/April- 2018****PHYSICS PAPER-401****(CORE)****Time: 2:30 Hours****Marks: 70****Instructions:**

1. All questions are compulsory.
 2. Figures to the right indicate marks.
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Q.1(A) Answer the following questions (any one). [7]

(1) Defining internal energy and specific heats of a gas, explain first law of thermodynamics.

(2) What is Joule – Thomson expansion? Explain Porous plug experiment.

Q.1(B) Answer the following questions (any one). [4]

(1) What is thermodynamics system? Write type of system with example.

(2) Derive Mayer's formula.

Q.1(C) Answer the following questions (any three). [3]

(1) Internal energy of an ideal gas depends upon _____.

(2) The first law of thermodynamics is the law of conservation of _____.

(3) Joule's mechanical equivalent of heat $J =$ _____ Joule/cal.

(4) The unit of specific heat in C.G.S. system is _____.

(5) The efficiency of a Carnot's engine working between 27°C and 327°C is _____.

Q.2(A) Answer the following questions (any one). [7]

(1) Describe entropy of a perfect gas. Obtain change in entropy in terms of (i) T and V , (ii) T and P and (iii) P and V .

(2) Explain Wien's displacement law and Rayleigh – Jean's law. Derive Wien's law and Rayleigh - Jean's law in relation to Planck's law.

Q.2(B) Answer the following questions (any one). [4]

(1) Write a note on temperature entropy diagram.

(2) State and explain Stefan – Boltzmann's law.

Q.2(C) Answer the following questions (any three). [3]

(1) During an adiabatic process, the change of entropy is _____.

(2) All natural processes taking place in the universe are _____.

(3) The entropy of a substance in gaseous state is _____ that in the liquid state.

(4) What is the value of Wien's displacement constant in $\text{cm}\cdot\text{k}$?

(5) Wien's law for black body radiation holds for _____ wavelengths.

Q.3(A) Answer the following questions (any one). [7]

(1) Deriving general expression of Maxwell's thermodynamic relation, derive four fundamental thermodynamic relations from it.

(2) Explaining Joule – Thomson effect, define Joule – Thomson coefficient.

Q.3(B) Answer the following questions (any one). [4]

(1) Derive Clausius – Clapeyron's latent heat equation.

(2) Derive Tds equations.

Q.3(C) Answer the following questions (any three). [3]

(1) Helmholtz free energy $F =$ _____.

(2) Write relation between Gibb's function and Helmholtz free energy.

(3) Relation between Gibb's function and Enthalpy is _____.

(4) For reversible isobaric process, the change in Enthalpy is equal to _____.

(5) For n mole perfect gas, the equation of state is _____.

Q.4(A) Answer the following questions (any one). [7]

- (1) Explaining principle, construction and working of photo diode, write its applications.
- (2) Explaining output characteristics of JFET, write only definition of its parameters.

Q.4(B) Answer the following questions (any one). [4]

- (1) Drawing emitter characteristic of UJT, explain it.
- (2) Explain NAND gate as universal gate.

Q.4(C) Answer the following questions (any three). [3]

- (1) When reverse voltage of varactor diode is increased, its junction capacitance _____.
- (2) The highest conversion efficiency of Si Solar cell is _____.
- (3) JFET has _____ input impedance.
- (4) UJT is _____ power absorbing device under normal operating conditions.
- (5) The binary system has a base of _____.

Q.5(A) Answer the following questions (any one). [7]

- (1) Derive an expression of current for L-C-R parallel a.c. circuit at resonance and explain Q factor.
- (2) Explaining action of Wien bridge oscillator, write its advantages and disadvantages.

Q.5(B) Answer the following questions (any one). [4]

- (1) Derive a.c. bridge balance condition.
- (2) Calculate frequency of oscillations for Colpitt's oscillator if $L = 0.5 \text{ millihenry}$, $C_1 = 2 \text{ PF}$ and $C_2 = 3 \text{ PF}$.

Q.5(C) Answer the following questions (any three). [3]

- (1) The condition $X_L = X_C$ is known as _____ condition.
- (2) L-C-R series a.c. circuit is called _____ circuit.
- (3) _____ bridge is used for comparing two capacitors.
- (4) Write unit of specific resistance.
- (5) In Hartley oscillator, feedback fraction $K_v = \text{_____}$.

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B.Sc. (CBCS) Semester - 4 Examination March/April – 2018

Subject: Physics Paper – 401

SCHEME OS ASSESSMENT

Q.1(C) (1) temperature (2) energy (3) 4.186 (4) erg/gm°C (5) 50 %

Q.2(C) (1) zero (2) irreversible (3) more than (4) 0.2896 (5) shorter

Q.3(C) (1) $U - TS$ (2) $G = F + PV$ (3) $H = G + TS$ (4) heat absorbed (5) $PV = nRT$

Q.4(C) (1) decreases (2) 22 % (3) high (4) low (5) 2

Q.5(B) (2) Here, $L = 5 \times 10^{-4} \text{ H}$, $C_1 = 2 \times 10^{-12} \text{ F}$, $C_2 = 3 \times 10^{-12} \text{ F}$, $f = ?$

$$f = \frac{1}{2\sqrt{LC}} = \frac{1}{2 \times 3.14 \times 2.449 \times 10^{-8}} = \frac{100 \times 10}{15.38} = 6.5 \times 10^6 \text{ Hz} = 6.5 \text{ MHz}$$

Q.5(C) (1) resonance (2) an acceptor (3) De Sauty (4) ohm.met (5) L_2 / L_1