BOARD QUESTION PAPER : JULY 2019

PHYSICS

Time: 3 Hours **Total Marks: 70**

Note:

i. All questions are compulsory.
ii. Draw neat, labelled diagrams wherever necessary.
iii Question paper consists of **29** questions divided into **FOUR** sections namely **A, B, C** and **D.**
iv. **Section A:** Select and write the most appropriate answer from the given alternative for Q. No.**1** to **4** of **multiple choice** type questions carrying **one mark** each and Q.No.**5** to **8** are **very short answer** type of questions carrying **one mark** each.
v. **Section B:** contains Q. No. **9** to **15** of **short answer-I** type questions carrying **two marks** each. Internal choice is provided to **only one** question.
vi. **Section C:** contains Q. No. **16** to **26** of **short answer-II** type of questions carrying **three marks** each. Internal choice is provided to **only one** question.
vii. **Section D:** contains Q. No. **27** to **29** of **long answer** type of questions carrying **five marks** each. Internal choice is provided to **each** question.
viii. For each **MCQ,** correct answer must be written along with its alphabet,
e.g., (A) ……. / (B) ……. / (C) ……. / (D) ……. etc.
ix. In case of **MCQs**, (i.e. Q. No. 1 to 4) evaluation would be done for the **first attempt** only.
x. Start each section on new page.
xi. Figures to the right indicate full marks.
xii. Use logarithmic table, if necessary. Use of calculator is **not** allowed.
xiii. Write proper units wherever necessary as per standard rules.

Physical Constants:

(1) Acceleration due to gravity, $g = 9.8\ m/s^2$
(2) Rydberg's constant, $R = 1.093 \times 10^7\ m^{-1}$

SECTION A [8]

Q.1 If the kinetic energy of hydrogen is 151.91 J at the pressure of 1 atmosphere, then its volume is (1)

(A) 3 litre (B) 2 litre
(C) 1 litre (D) 0.5 litre

Q.2 A wavelength in the middle of visible spectrum will be shifted towards red when the source and the observer move away from each other. This is due to (1)

(A) interference of light (B) dispersion of light
(C) polarisation of light (D) Doppler effect in light

Q.3 If the longitudinal wave travelling in rarer medium is incident on the boundary of denser medium, then the phase of wave changes by (1)

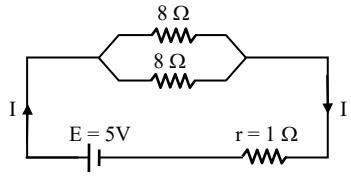
(A) 2π rad (B) π rad
(C) $\frac{\pi}{2}$ rad (D) $\frac{\pi}{4}$ rad

Q.4 In a step-up transformer, ratio of the turns is (1)

(A) greater than 1 (B) less than 1
(C) equal to 1 (D) never equal to 1

Q.5 What happens if the rod of dia-magnetic material is placed in a nonuniform magnetic field? (1)

Q.6 Find the total current 'I' flowing through the following circuit:



(1)

Q.7 What is the expression for minimum angular momentum of electron in hydrogen atom? (1)

Q.8 A rod of length 4 cm is movable on a rectangular frame of wire. A film is formed in the frame. A force of 3.2×10^{-3} N is applied to the rod for its equilibrium. Find the surface tension of the liquid. (1)

SECTION B **[14]**

Q.9 A coil has 'n' turns, each of cross-sectional area 1.6 cm^2. The axis of the coil is kept inclined at 30° with the direction of uniform magnetic field of induction 2 N/Am. The torque of 0.02 Nm is experienced by the coil, when a current of 1.25 A flows through each turn. Calculate n.

OR

The susceptibility of magnesium at 300 K is 1.2×10^{-5}. At what temperature the susceptibility will decrease by 0.4×10^{-5}? (2)

Q.10 State Kirchhoff's second law for a closed circuit. How will you minimize the errors in Kelvin's method? (2)

Q.11 Define U.C.M.
Name the forces acting on a body executing nonuniform circular motion. (2)

Q.12 Explain the principle of conservation of angular momentum with the help of two appropriate examples. (2)

Q.13 Define bandwidth of signal and frequency modulation. (2)

Q.14 Define epoch of S.H.M. State the factors on which the total energy of a particle performing S.H.M. depends. (2)

Q.15 A driver in a stationary bus blows horn with frequency 1024 Hz. Another bus directly behind the stationary bus is approaching it at the speed of 54 km/hr. Find the frequency of sound heard by the driver in the moving bus.
[Speed of sound in air is 340 m/s.] (2)

SECTION C **[33]**

Q.16 Obtain an expression for average power dissipated in series LCR A.C. circuit. Hence obtain an expression for power factor of the circuit. (3)

Q.17 When does the p-n junction diode act as a closed switch and as an open switch? State any four advantages of semiconductor devices. (3)

Q.18 Calculate the wavelength of H_γ line and series limit for Brackett series. (3)

Q.19 On the basis of molecular theory explain the phenomenon of surface tension. (3)

Q.20 Describe an experiment for the study of characteristics of photoelectric effect. (3)

Q.21 Define the term 'damped oscillations'.
A body of mass 1 kg is made to oscillate on a spring of force constant 25×10^3 dyne/cm. Calculate the magnitude of angular velocity and frequency of vibrations of the body. (3)

Q.22 State Ampere's circuital law.
Using Ampere's circuital law, obtain an expression for magnetic induction at any point due to a straight conductor carrying current. (3)

Q.23 Obtain an expression for energy of a charged capacitor and express it in different forms. (3)

Q.24 State the principle of superposition of waves.
Distinguish between forced vibrations and resonance. (3)

Q.25 State and prove the Kirchhoff's law of radiation theoretically.

OR

State Boyle's law.
On the basis of kinetic theory of gases, obtain an expression for kinetic energy per unit volume of gas. (3)

Q.26 In Melde's experiments, when a tuning fork is arranged in perpendicular position and a wire is stretched by an empty pan, 6 loops are obtained. When 1 gram of weight is added to the pan, number of loops becomes 4. Find the mass of pan.
Without disturbing the experimental setup, the position of the fork is changed to parallel position, how many loops will be formed with and without mass in pan? (3)

SECTION D [15]

Q.27 A. Obtain an expression for binding energy of a satellite revolving around the earth close to its surface. (3)

B. A car rounds a curve of radius 625 m with a speed of 45 m/s. What is the minimum value of coefficient of friction which prevents the car from sliding? (2)

OR

A. Discuss the variation of acceleration due to gravity with latitude. (3)

B. Find the frequency of revolution of a round disco stage revolving with an angular speed of 300 degree/second. (2)

Q.28 A. Explain the behaviour of a metal wire under increasing load. (3)

B. Find the radius of gyration of a rod of length 3 m about its transverse axis passing through its one end. (2)

OR

A. Describe an experiment to determine Young's modulus of the material of wire. (3)

B. The M.I. of solid sphere about an axis passing through its centre is 2 kg-m^2. Calculate its M.I. about a tangent passing through any point on its surface. (2)

Q.29 A. Explain Rayleigh's criterion for the resolution of two close point objects, when their images are
i. just resolved, ii. well resolved and iii. unresolved. (3)

B. A parallel beam of monochromatic light is incident on a glass slab at an angle of incidence 30°, gets refracted through an angle of 19° 28′. Find the ratio of width of parallel beam in air to that in glass. (2)

OR

A. Give the analytical treatment for interference bands. Hence obtain an expression for path difference between the interfering waves. (3)

B. Find the polarising angle for the material of refractive index $\frac{9}{5}$. (2)