

Sub.Code : 1021'O'

NEB - GRADE XII

2079 (2022)

Physics

New course

For regular students (except technical stream)

Candidates are required to give their answers in their own words as far as practicable. The figures in the margin indicate full marks.

Time: 3 hrs.

Full Marks: 75

Attempt all the questions.

Group 'A'

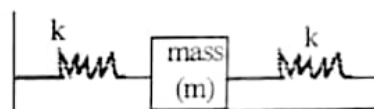
11×1=11

Rewrite the correct options of each questions in your answer sheet.

1. In rotational motion, the physical quantity that imparts angular acceleration is,
 (A) Force (B) Torque (C) Moment of inertia
 (D) Angular momentum

2. Two identical springs are arranged with a block as in figure. The oscillation frequency of the mass is 'f'. If one spring is removed, the frequency of the oscillation will be,

- (A) f (B) 2f
 (C) $\sqrt{2}f$ (D) $\frac{f}{\sqrt{2}}$



3. A liquid does not wet the surface of a solid if the angle of contact is,
 (A) 90° (B) less than 90° (C) greater than 90° (D) 0°

4. Identify the wrong statement
 (A) for isothermal process, $\Delta T = 0$
 (B) for isochoric process, $\Delta V = 0$
 (C) for isobaric process, $\Delta P = 0$
 (D) for cyclic process, $\Delta W = 0$

5. The maximum efficiency of an engine operating between 30°C and 300°C is,
 (A) 4.71% (B) 47% (C) 90% (D) 9%

6. In which frequency range the infrasonic wave lies?
 (A) (10-20)Hz (B) (30-40)Hz (C) (20-30)Hz (D) (50-60)Hz

7. In Fraunhofer diffraction, the incident wave front should be,
 (A) elliptical (B) plane (C) spherical (D) cylindrical

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8. If specific resistance of a potentiometer wire is $10^{-7} \Omega\text{m}$, current flowing through it is 0.1A and cross sectional area of wire is 10^{-6}m^2 , then potential gradient will be,
 (A) 10^{-2}V/m (B) 10^{-4}V/m (C) 10^{-6}V/m (D) 10^{-8}V/m

9. A coil having N-number of turns and cross-section area A carries a current

1. The quantity NIA is,
 (A) magnetic flux (B) magnetic field
 (C) magnetic susceptibility (D) magnetic moment

10. At resonance, in series LCR circuit, which relation does not hold good,

- (A) $\omega = \frac{1}{\sqrt{LC}}$ (B) $L\omega = \frac{1}{C\omega}$ (C) $C\omega = \frac{1}{L\omega}$ (D) $\omega = \frac{1}{LC}$

11. Which of the following one is correct?

- (A) $E^2 = P^2 C$ (B) $E^2 = P^2 C^2$ (C) $E^2 = PC^2$ (D) $E^2 = P^2/C^2$

Group 'B'

8×5=40

12. The angular speed is inversely proportional to the moment of inertia, that is given by the principle of conservation of energy.

- a) In a flywheel, most of the mass is concentrated at the rim? Explain why? 1

- b) The angular velocity of the earth around the sun increases, when it comes closer to the sun. Why? 2

- c) If the earth were to shrink suddenly, what would happen to the length of the day? 2

13. Simple harmonic motion is defined from periodic functions like sine or cosine functions,

- a) State the basic equation of motion for a body executing simple harmonic motion. 1

- b) Find expression for velocity and acceleration of a particle describing SHM. 2

- c) The tip of tuning fork goes through 550 complete vibrations in 1 sec. Find the angular frequency and time period of the motion. 1+1=2

OR

- a) Define surface tension 1

- b) State Bernoulli's theorem. 1

- c) Castor oil at 20°C has a coefficient of viscosity 2.42 Nsm^{-2} and density 940 kgm^{-3} . Calculate the terminal velocity of a steel ball of radius 2mm falling under the gravity in the oil, taking the density of steel as 7800 kgm^{-3} . ($g = 10 \text{ m/s}^2$) 3

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14. Adiabatic process:

- a) Define adiabatic process in thermodynamics. 1
 b) Derive expression for work done during adiabatic process. 3
 c) Write the mathematical expression of entropy. 1
15. a) Define an organ pipe. 1
 b) Describe the various modes of vibration of the air column in a closed organ pipe. 3
 c) What is end correction? 1

OR

- a) State Doppler's effect. 1
 b) Derive the apparent frequency of sound when an observer moves towards a stationary source. 2
 c) A stationary motion detector sends sound waves of 150 KHz towards a truck approaching at a speed of 120km/hr. What is the frequency of wave reflected back to detector? (Velocity of sound in air = 340m/s) 2
16. a) Differentiate Seebeck's effect and Peltier's effect. 2
 b) Explain the variation of thermo-emf with temperature. 3
17. When a charge particle moves in a uniform magnetic field, it experiences a force, called the Lorentz force.
 a) What is the vector representation of Lorentz force? 1
 b) State Fleming left hand rule. 1
 c) A horizontal straight wire 5cm long weighing 1.2gm^{-1} is placed perpendicular to a uniform horizontal magnetic field of flux density 0.6T. If the resistance of the wire is $3.8\Omega\text{m}^{-1}$, calculate the p.d. that has to be applied between the ends of the wire to make it just self-supporting. 3

18. Electron is deviated in electric and magnetic fields.

- a) What path does the electron follow in electric field when the electron is projected normally in the field? 1
 b) An electron passes through a space without deviation. Does it mean, there is no fields? 2
 c) Is there any condition that an electron does not experience any force inside the magnetic field? 2
19. a) What is rectification? 1
 b) Explain rectifier circuit operation with two diodes. 3
 c) What happens when one of the diode becomes functionless? 1

Group 'C'

8x3=24

20. a) Write sustainable conditions for interference? 2

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- b) "The bright and dark fringes are equally spaced." Justify this statement from Young's double slit experiment. 3
 c) In a Young's slits experiment the separation of first to fifth fringes is 2.5 mm when the wave length used is 620 nm. The distance from the slits to the screen is 80 cm. Calculate the separation of two slits. 3
21. Kirchhoff's laws in electricity are very useful in solving the complicated circuit connections.
 a) What is the significance of first law? 1
 b) State and explain second law with circuit diagram. 2
 c) Apply these laws to calculate unknown value of resistance. 3
 d) What is meter bridge? Write name of material used to construct meter bridge. 1+1=2

OR

- a) Derive the expression for impedance in L-C-R circuit. 3
 b) Find the condition of resonance L-C-R circuit. 2
 c) A circuit consists of a capacitor of $2\mu\text{F}$ and a resistor of 1000Ω . An alternating emf of 12V (rms) and frequency 50 Hz is applied. Find the current flowing, the voltage across capacitor and the phase angle between the applied emf and current. 3
22. a) State Bohr's postulate of atomic model. 2
 b) Derive an expression for radius of n^{th} orbit in H-atom. 3
 c) Calculate de Broglie wavelength of electron when it is accelerated by 500 volt. (mass of electron $9.1 \times 10^{-31}\text{ kg}$, Planck's constant $6.62 \times 10^{-34}\text{ Js}$, charge of electron $1.6 \times 10^{-19}\text{ C}$) 3

OR

Radio activity is the spontaneously occurring phenomenon in nature.

- a) What is radio activity? 1
 b) Obtain $N = N_0 e^{-\lambda t}$ in radio active decay law. 3
 c) Describe the significance of decay curve showing the longest life time of radio-isotopes. 1
 d) The half life of radium is 1620 years. After how many years 25% of a radium block remains undecayed? 3

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