

Time: 3Hrs Subject: Physics, Grade - XII, Subject code: 1021

Candidates are required to give answer in their own words as far as practicable. The figure given in the margin indicates full marks.

Group-A

Objective questions: [11 x 1 = 11]

Rewrite the correct option of each question in your answer sheet.

1. Time taken by simple pendulum to travel from mean position to half of amplitude is T_1 and from extreme position is T_2 . Correct relation between these two times is....
a. $T_1 = T_2$ b. $T_1 > T_2$ c. $T_1 < T_2$ d. $T_1 = 2T_2$
2. Spring constant K of spring and its length L are related as.....
a. $K \propto L$ b. $K \propto L^2$ c. $K \propto \sqrt{L}$ d. $K \propto L^{-1}$
3. The maximum velocity and maximum acceleration of a particle having SHM are 4 ms^{-1} and 2 ms^{-2} respectively. Its time period of oscillation is...
a. $\frac{\pi}{2}$ b. 4π c. $\frac{2}{\pi}$ d. 6π
4. Maximum work is done during.....process.
a. isothermal b. isobaric c. isochoric d. adiabatic
5. Internal energy of real gas depends on....
a. pressure b. volume c. temperature d. b & c
6. Correct statement is.....
a. ammeter has high resistance. b. voltmeter is connected in series..
c. ammeter is connected in series. d. ammeter is connected in parallel.
7. Electron is moving without deviation in the region of magnetic field. Angle made by the velocity of electron with magnetic field is.....
a. 0° b. 30° c. 45° d. 90°
8. Maximum kinetic energy of emitted electron from metallic surface depends
a. only on frequency of incident radiation.
b. on frequency of incident radiation and work function of metal.
c. on work function of metal.
d. only on intensity of incident radiation.

9. Path of electron moving along the direction of uniform electric field is.....

- a. straight b. parabolic c. hyperbolic d. elliptical

10. Thomson experiment is based on.....field.

- a. magnetic b. gravitational c. electric d. cross

11. Which of the following represents stationary wave?

- a. $y = 2A \cos kx \sin \omega t$ b. $y = A \cos kx \sin \omega t$
c. $y = 2A \cos kx \sin \omega t$ d. $y = 2A \cos \omega t \sin kx$

Group-B

Short answer questions: [8 x 5 = 40]

12. a. Justify that all harmonic motions are not simple harmonic motions.
b. Find time taken by simple pendulum to travel half of the amplitude from mean position. [3]
13. a. Obtain an expression for time period of mass spring system. [2]
b. Find an expression for equivalent spring constant when two springs with spring constants K_1 and K_2 are connected in parallel. [3]

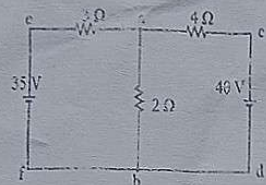
Or

- a. State principle of superposition. [2]
b. Progressive wave $y = 0.02 \sin(20\pi t - 10\pi x)$ is propagating in the medium; where x is in cm, y is in mm and t is in second. Find particle velocity at $t = 0.5 \text{ s}$ at a point 2 m away from origin along positive x -axis. [3]
14. a. Why C_p is greater than C_v ? [2]
b. Derive an expression for work done during isothermal expansion of ideal gas. [3]

Or

- a. Define wave front and wavelet. [2]
b. Describe reflection of light on the basis of wave theory of light. [3]

15. a. Describe method for converting galvanometer into voltmeter. [2]
 b. Find power consumed across 2Ω resistance in the given circuit. [3]



16. a. What are the conditions for the formation of standing wave? [2]
 b. Prove that distance between two successive nodes in standing wave is half of the wavelength of individual waves forming it. [3]
 17. a. What is the cause of Seebeck effect? [2]
 b. Variation of thermoe emf in a thermocouple with temperature θ of hot junction is as $\epsilon = 4.1 \times 10^{-5}\theta - 4.1 \times 10^{-8}\theta^2$ and temperature of cold junction is 10°C . Find neutral temperature and temperature of inversion. [3]
 18. a. State Biot-Savart law. [2]
 b. A circular coil of 100 turns has a radius of 10 cm and carries a current of 5 A. Find the magnetic field at a point on the axis of the coil at a distance of 5 cm from the its center. [3]
 ($\mu_0 = 4\pi \times 10^{-7} \text{ Hm}^{-1}$)
 19. a. Apply first law of thermodynamics to various thermodynamic processes. [2]
 b. Four mole of ideal gas under goes isothermal expansion from 3 liters to 6liters at constant temperature 27°C . Find amount of work done. ($R = 8.31 \text{ Jmol}^{-1}\text{K}^{-1}$) [2]

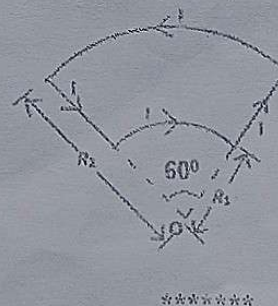
Group-C

Long answer questions: [3 x 8 = 24]

20. a. Under what condition electron acquires zero deflection in cross field. [2]
 b. Prove that electron follows parabolic path in electric field. [3]
 c. Electron is moving with velocity $(2\hat{i} - \hat{j} - 2\hat{k}) \text{ ms}^{-1}$ in the region of magnetic field $(2\hat{i} + \hat{j} + 2\hat{k}) \text{ tesla}$. Find angle between velocity and magnetic field. [3]

Or

- a. What is the difference between photon and photoelectron? [2]
 b. Describe experimental arrangement for studying photoelectric effect. [3]
 c. Find the change in stopping potential when the wavelength of a radiation is decreased from 400 nm to 300 nm on the same metallic surface.
 ($c = 1.6 \times 10^{-19} \text{ C}$, $c = 3 \times 10^8 \text{ ms}^{-1}$ & $h = 6.62 \times 10^{-34} \text{ Js}$) [3]
 21. a. State Krichhoff's laws. [2]
 b. Prove that polarity of cell can be changed in Wheatstone bridge. [3]
 c. A moving coil meter has a resistance of 25 ohm and indicates full scale deflection when a current of 4.0 mA flows through it. How could this meter be converted to a milliammeter having full scale deflection for a current of 50 mA? [3]
 Or
 a. What will happen to the balancing length when length of potentiometer wire is increased? [2]
 b. State and prove principle of potentiometer. [3]
 c. The emf of a battery is balanced by a length 75 cm on a potentiometer wire and e.m.f. of standard cell of 1.02 volt is balanced by a length 50 cm on it. Calculate the e.m.f. of the battery. [3]
 22. a. State and explain Ampere's law. [2]
 b. Use Ampere's law to find out magnetic field at a point due to straight current carrying conductor. [3]
 c. Find magnetic field produced at point O. [3]



Time: 3Hrs Subject: Physics, Grade - XII, Subject code: 1021

Candidates are required to give answer in their own words as far as practicable.

The figure given in the margin indicates full marks.

Group-A

Objective questions

Rewrite the correct options in your answer sheet: (11 x 1 = 11)

- Simple pendulum is taken inside lift which is moving upward with uniform velocity. Time period of pendulum will become
a. remains as such b. increases c. decreases d. becomes zero
- Path difference between two points having phase difference 30° is.....
a. $\lambda/3$ b. $\lambda/6$ c. $\lambda/9$ d. $\lambda/12$
- A 2 kg block oscillates with amplitude of 1 m and frequency 2 Hz. Total energy of body will be...
a. $4\pi^2 J$ b. $8\pi^2 J$ c. $12\pi^2 J$ d. $16\pi^2 J$
- Carnot's heat engine working between $127^\circ C$ and $27^\circ C$ has efficiency....
a. 20 % b. 25 % c. 30 % d. 35 %
- Ideal gas equation can be written as.....
a. $P = r\rho T$ b. $P = r\rho V$ c. $P = R\rho T$ d. $P = m\rho l$
- Correct statement is.....
a. oxygen is diamagnetic. b. copper is ferromagnetic
c. cobalt is paramagnetic d. nickel is ferromagnetic
- Uniform wire is bent into an equilateral triangle. If magnetic field at the center of triangle due to one side is B then total magnetic field at center will be
a. B b. 3B c. 6B d. 9B
- Potential required to stop emission of photoelectron is
a. excitation potential b. quantization potential
c. stopping potential d. ionization potential
- Radius of circular path of electron moving in magnetic field can be written as.....
a. $r = \frac{\sqrt{3m_e k_B T}}{eB}$ b. $r = \frac{\sqrt{m_e k_B T}}{eB}$ c. $r = \frac{\sqrt{3m_e k_B T}}{2eB}$ d. $r = \frac{\sqrt{2m_e k_B T}}{3eB}$
- In cross field, charge particle moves.....
a. along straight path b. in a circle
c. in a parabolic path d. along a helical path

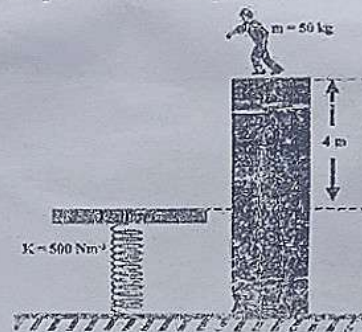
11. Which of the following represents progressive wave?

- a. $y = A \sin \left\{ 2\pi \left(\frac{t}{T} - \frac{x}{\lambda} \right) \right\}$ b. $y = A \sin \left\{ \left(\frac{t}{T} - \frac{x}{\lambda} \right) \right\}$
c. $y = A \sin \left\{ \pi \left(\frac{t}{T} - \frac{x}{\lambda} \right) \right\}$ d. $y = A \sin \left\{ 2\pi \left(\frac{t}{T} - \lambda x \right) \right\}$

Group-B

Short answer questions: (8 x 5 = 40)

12. a. How simple harmonic motion can be represented on circle? (2)
b. Man jumps on the platform as shown in the figure. Find maximum compression of the platform. (3)



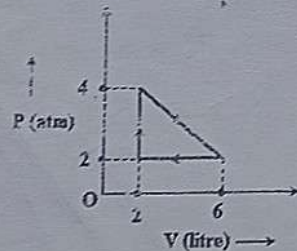
13. a. A man sitting on the swing suddenly stands on the swing. What will happen to the motion of swing? (2)
b. Prove that total energy of body having S.H.M. is constant between two extreme positions. (3)

Or

- a. Why echo cannot be heard in small room? (2)
b. A car is going along straight path with constant speed 20 ms^{-1} normally toward a cliff. Driver of car blow a horn when car is at a distance of 1 km from cliff. When and where driver of car will hear echo? (velocity of sound in air 340 ms^{-1}) (3)
14. a. What are the conditions for constructive and destructive interferences in terms of path and phase differences? (2)
b. Find percentage change in the fringe width when double slit experiment carried with light of wavelength 500 nm is replaced by light of wavelength 600 nm keeping same geometry. (3)

Or

- ① a. State Huygen's principle wave theory of light. (2)
 b. Describe refraction of light on the basis of wave theory of light. (3)
- ② 15. a. State and explain Kirchhoff's laws. (2)
 b. Describe method for converting galvanometer into ammeter. (3)
- ③ 16. a. Draw diagram showing open pipe in third mode of longitudinal vibration. (2)
 b. First and second resonating lengths in closed pipe were found 15 cm and 46 cm respectively when air temperature was 27°C . Find velocity of sound in air at 0°C . (3)
- ④ 17. a. What is the difference between diesel engine and petrol engine? (2)
 b. Calculate the change in entropy when 2 g steam at 100°C is converted into water at 0°C . (3)
 ($L_s = 540 \text{ cal g}^{-1}$ & specific heat capacity of water $4200 \text{ J kg}^{-1} \text{K}^{-1}$)
- ⑤ 18. a. Obtain dimensional formula of coefficient of self induction. (2)
 b. A circular coil of 100 turns has a radius of 10 cm. Find energy stored in it when current of 1 A conduct through it. (3)
 ($\mu_0 = 4\pi \times 10^{-7} \text{ H m}^{-1}$)
- ⑥ 19. a. Define entropy. In which thermodynamic process entropy change is zeros? (2)
 b. Find total amount of work done in the given P-V diagram. (3)



Group-C

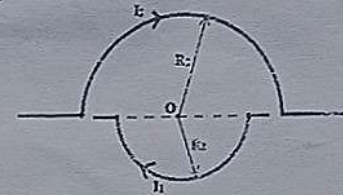
Long answer questions: (3 x 8 = 24)

- ② 20. a. How velocity of charged particle is measured in cross field. (2)
 b. Electron may follow straight or parabolic path in electric field. What are necessary conditions for these paths? (3)
 c. Electron is moving with velocity $(2\hat{i} + \hat{j} + 2\hat{k}) \text{ ms}^{-1}$ in the region of magnetic field $(2\hat{i} + \hat{j} + 2\hat{k}) \text{ tesla}$. Find magnitude of force acting on electron due to magnetic field. (3)

Or

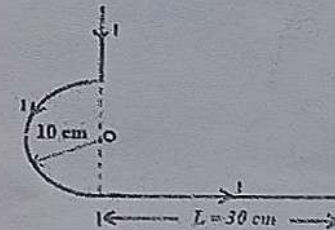
- a. What are the laws of photoelectric emission? (2)

- b. Describe experimental arrangement for studying photoelectric effect. (3)
 c. Find the change in stopping potential when the wavelength of a radiation is decreased from 400 nm to 300 nm on the same metallic surface. (3)
 ($e = 1.6 \times 10^{-19} \text{ C}$, $c = 3 \times 10^8 \text{ ms}^{-1}$ & $h = 6.62 \times 10^{-34} \text{ Js}$)
- ④ 21. a. Why steel is used to make permanent magnet? (2)
 b. Derive an expression for e.m.f. induced in a coil rotating in a magnetic field. (3)
 c. Assuming $I_2 < I_1$ find expression for total magnetic field produced common center O. (3)



Or

- a. What is the benefit of using concave pole pieces of permanent magnets in moving coil galvanometer? (2)
 b. Prove that attractive force act between parallel wires when current conduct through them in the same direction. (3)
 c. Current of 1 A is flowing in the wire as shown in the figure. Find magnetic field produced at point O. (3)



2. a. What will happen to the balancing length of potentiometer wire when resistance is connected in series with the wire? (2)
 b. Prove Wheatstone bridge principle. (3)
 c. A metallic sphere having volume 20 cm^3 is drawn into uniform wire of diameter 1mm. When 1 A current is passed, p.d. across wire is 2 v. Find resistivity of wire. (3)

Time: 3Hrs Subject: Physics, Grade -XII, Subject code: 1021

Candidates are required to give answer in their own words as far as practicable. The figure given in the margin indicates full marks.

Group-A

Objective questions

Rewrite the correct options in your answer sheet: (11 x 1 = 11)

1. Simple pendulum is taken inside vehicle which is moving on a level road with constant acceleration "a". Time period of pendulum will become

a. $T = 2\pi \sqrt{\frac{l}{g}}$ b. $T = 2\pi \sqrt{\frac{l}{(g+a)}}$
c. $T = 2\pi \sqrt{\frac{l}{(g-a)}}$ d. $T = 2\pi \sqrt{\frac{l}{g^2 + a^2}}$

2. Phase difference between two points having path difference $\lambda/4$ is.....

a. 0° b. 45° c. 90° d. 180°

3. The maximum velocity and maximum acceleration of a particle having SHM are 4 ms^{-1} and 2 ms^{-2} respectively. Its time period of oscillation is...

a. $\frac{\pi}{2}$ b. 4π c. $\frac{2}{\pi}$ d. 6π

4. Whole amount heat is converted into mechanical work during..... process.

a. isothermal b. isobaric c. isochoric d. adiabatic

5. Carnot's cycle consists..... processes.

a. two isothermal and two adiabatic b. all isothermal
c. one isothermal and three adiabatic d. all adiabatic

6. Correct statement is.....

a. ammeter has high resistance. b. voltmeter is connected in series..
c. ammeter is connected in series. d. ammeter is connected in parallel.

7. Uniform wire of length l is bent into circle and then current I is passed through it. Magnetic field at center will be.....

a. $\frac{\mu_0 I}{2l}$ b. $\frac{\mu_0 I}{\pi l}$ c. $\frac{\mu_0 I}{2\pi l}$ d. $\frac{\mu_0 \pi I}{l}$

8. Minimum energy required to eject electron from metallic surface is called

a. threshold energy b. quantization energy
c. work function d. ionization energy

9. Path of electron moving in uniform electric field is straight. Angle made by the velocity of electron with magnetic field is.....

a. 0° b. 45° c. 90° d. 0° or 180°

10. Cross field is related with.....

a. Millikan's oil drop experiment b. Thomson's experiment
c. Einstein photoelectric equation d. Cathode rays

11. Which of the following represents progressive wave?

a. $y = A \sin(\omega t - kx)$ b. $y = A \cos kx \sin \omega t$
c. $y = 2A \sin(\omega t - kx)$ d. $y = A \sin(kx - \omega t)$

Group-B

Short answer questions: (8 x 5 = 40)

12. a. What is the difference between harmonic motion and simple harmonic motion. (2)

- b. Find time taken by simple pendulum to travel $3/8$ of its oscillation from mean position. (3)

13. a. Time period of simple pendulum inside lift increases first and few second later pendulum does not oscillate. What can you say about the motion of lift? (2)

- b. Prove that body having S.H.M. obeys principle of conservation of energy. (3)

Or

- a. Prove that minimum distance of reflecting surface from listener to hear echo is nearly 17 m. (2)

- b. Progressive wave $y = 0.04 \sin(40\pi t - 30\pi x)$ is propagating in the medium; where x is in cm, y is in mm and t is in second. Find particle velocity at $t = 0.5$ s at a point 1 m away from origin along positive x-axis. (3)

14. a. Relate optical path and geometrical path. (2)

- b. Find percentage change in the fringe width when double slit experiment is carried inside water keeping same geometry. (3)

Or

- a. Define wave front and wavelet. (2)

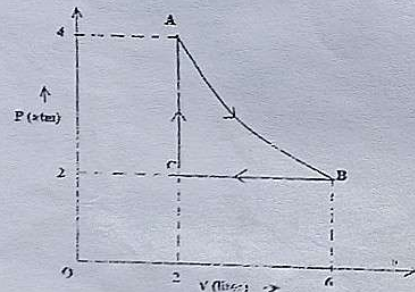
- b. Describe reflection of light on the basis of wave theory of light. (3)

15. a. Describe method for converting galvanometer into voltmeter. (2)

- b. Describe Seebeck experiment. (3)

16. a. Draw diagram showing closed pipe in third mode of longitudinal vibration. (2)

- b. First and second resonating lengths in closed pipe were found 15 cm and 46 cm respectively. Find internal diameter of pipe. (3)
17. a. What is the difference between heat engine and refrigerator? (2)
- b. Calculate the change in entropy when 20 g water at 27°C is mixed with 50 g water at 77°C .
(Specific heat capacity of water $4200 \text{ J kg}^{-1}\text{K}^{-1}$) (3)
18. a. State Faraday's laws of electromagnetic induction. (2)
- b. A circular coil of 100 turns has a radius of 10 cm. Find e.m.f. induced in it when flowing through it changes from 1 A to 2 A in 0.1 s. ($\mu_0 = 4\pi \times 10^{-7} \text{ Hm}^{-1}$) OR (3)
- a. Obtain an expression for efficiency of Carnot's heat engine. (2)
- b. Considering adiabatic expansion of one mole of ideal gas, calculate amount of work done along AB in the given PV-diagram. (3)



19. a. Show P-V diagrams for various thermodynamic processes. (2)
- b. Calculate amount of work done when 4 mole of ideal gas undergoes isobaric expansion from 27°C to 127°C at 2 atm.
($R=8.31 \text{ Jmol}^{-1}\text{K}^{-1}$) (3)

Group-C

Long answer questions: (3 x 8 = 24)

20. a. How velocity of charged particle is measured in cross field. (2)
- b. Electron may follow straight or parabolic path in electric field. What are necessary conditions for these paths? (3)
- c. Electron is moving with velocity $(2\hat{i} + \hat{j} + 2\hat{k}) \text{ ms}^{-1}$ in the region of magnetic field $(2\hat{i} + \hat{j} + 2\hat{k}) \text{ tesla}$. Find magnitude of force acting on electron due to magnetic field. (3)

Or

- a. What is the difference between photon and photoelectron? (2)

- b. Describe experiment for measuring Planck's constant. (3)
- c. Find the change in stopping potential when the wavelength of a radiation is decreased from 4000 angstrom to 6000 angstrom on the same metallic surface.
($e = 1.6 \times 10^{-19} \text{ C}$, $c = 3 \times 10^8 \text{ ms}^{-1}$ & $h = 6.62 \times 10^{-34} \text{ Js}$) (3)
21. a. Why soft iron is used to make core of transformer? (2)
- b. Derive an expression for energy stored in an inductor. (3)
- c. Two circular rings with radii 10 cm and 15 cm are placed with common center such that their planes are perpendicular to each other. Find total magnetic field produced at their common center when a current of 1 A is send through them.
($\mu_0 = 4\pi \times 10^{-7} \text{ Hm}^{-1}$) (3)

Or

15. a. What will happen to the balancing length of potentiometer wire when resistance is connected in series with the galvanometer? (2)
- b. State and prove principle of potentiometer. (3)
- c. The emf of a battery is balanced by a length 75 cm on a potentiometer wire and e.m.f. of standard cell of 1.02 volt is balanced by a length 50 cm on it. Calculate the e.m.f. of the battery. (3)
22. a. State and explain Ampere's law. (2)
- b. Obtain an expression for Hall coefficient. (3)
- c. Current of 1 A is flowing in the wire as shown in the figure. Taking R_1 10 cm and R_2 20 cm, find magnetic field produced at point O. (3)

