

COUNCIL OF CBSE AFFILIATED SCHOOL IN THE GULF
GULF SAHODAYA (SAUDI CHAPTER) EXAMINATION - 2016

CLASS – XI

PHYSICS

Time Allowed : 3 hours

Maximum Marks : 70

SET-‘A’

General Instruction:

- (i) *All questions are compulsory.*
- (ii) *There is no over all choice. However an internal choice has been provided in one question of two marks, one question of three marks, all three questions of five marks.*
- (iii) *Question number 1 to 5 marks are very short answer type questions, carrying one mark each.*
- (iv) *Question number 6 to 10 short answer type questions, carrying two marks each.*
- (v) *Question number 11 to 22 are short type questions, carrying three marks each.*
- (vi) *Question number 23 is a value based question carrying four marks.*
- (vii) *Question number 24 to 26 are long type question, carrying five marks each.*
- (v) *Use of calculator is not permitted. However you may use log table if necessary.*

1. What is limiting static friction? On what factor does it depend? 1
2. What are concurrent forces? 1
3. Define accuracy and precession. 1
4. Draw Position-Time graph for 1
 - (i) A body dropped from a certain height and falling freely under gravity.
 - (ii) A rain drop falling continuously after attaining terminal velocity.
5. Liquid drops are spherical. Why? 1
6. Obtain an expression for the minimum speed required by the body to become a satellite of earth, in terms of mass of the earth and its distance from the centre of earth. 2
7. What is simple harmonic motion? The displacement of a body in periodic motion is given by $y = y_0 \sin \omega t$. Obtain expression for the acceleration of the body. 2
8. Show that the kinetic energy of a gaseous molecule depend only upon the temperature. 2

9. The observations of voltage and current in an electric circuit are $V = 20 \pm 0.1$ volt and $I = 4 \pm 0.25$ ampere respectively. Find the percentage error in the measurement of resistance in the circuit. 2

OR

Speed of sound in air depends on pressure (P) and density(ρ). By using method of dimension, establish a formula for this speed. Take constant of proportionality $K = 1$

10. What is Clausius statement for second law of thermodynamics? Draw block diagram to represent the working of refrigerator. 2
11. Show that the motion of a simple pendulum is simple harmonic. Obtain expression for its time period also. 3
12. What is projectile? A body is thrown from ground with a speed v_0 at an angle θ with horizontal. Show that it follows parabolic path. 3
13. Why do the gases have two specific heats? Show that $C_p - C_v = R$, where C_p and C_v are molar specific heat capacity of gas at constant pressure and volume respectively, and R is gas constant. 3
14. Obtain expression for the maximum velocity with which a vehicle can take turn safely over circular rough horizontal track. Why does it become difficult to take turn on a wet track? 3
15. A body is dropped from a height h. Show that its total mechanical energy remains constant through out the fall (ignoring air resistance). 3
16. State Law of Equipartition of Energy. Obtain expression for the molar specific heats of a diatomic gas (with vibrating molecules) at constant volume and at constant pressure. 3
17. For a body thrown from ground with speed u at an angle θ with horizontal, Show that $4H_{\max} = R \tan^2 \theta$, where the terms have their usual meaning. 3

OR

Show that the range of a projectile, thrown from ground with speed u at an angle θ with horizontal, is same when projected with same speed but an angle $90 - \theta$ with horizontal. Find the ratio of H_{\max} of the body for these two angle of projection.

18. A ball is thrown vertically upward with a velocity of 20 m/s from the top a building of height 30 m from the ground.

(a) How high from the ground the ball will reach before returning back?

19. What is a torque? Show that the rate of change of angular momentum of a particle is equal to the torque acting on it. ($\tau = dL/dt$) 3
20. State theorem of perpendicular axes. By using this theorem find the expression of moment of inertia of solid disc of mass m and radius R about its diameter, if its moment of inertia about an axis passing through its centre and perpendicular to its plane is $\frac{1}{2} mR^2$. 3
21. Show that the value of g decreases with height. At what height, a 80 kgwt person experiences only 20 kgwt? Radius of earth is 6400 km. 3
22. What is an elastic collision? Two identical spheres moving along same line with speed u_1 and u_2 ($u_1 > u_2$) collide elastically and continue moving on the same line. Show that their speeds are interchanged during this collision. 3
23. Nilofar was studying in class 11. Once she noticed that her two year old brother was moving towards gas stove on which her mother kept water which was boiling. She rushed and pulled him back.
- What values of Radha are appreciable?
 - Why does steam cause more severe burn than boiling water?
 - Calculate the amount of heat absorbed when 100 ml of water is converted into steam at boiling temperature. Latent heat of vaporisation of water is 2250 J/gm. Density of water is 1gm/ml. 4
24. State and prove Bernoulli's theorem. Explain swinging of spinning ball in air by using Bernoulli's theorem. 5

OR

What is excess pressure inside a liquid drop or bubble?

Show that $p_i - p_o = 2S/R$, for a liquid drop, where p_i & p_o are its inside and outside pressures, S is the surface tension and R is the radius of the drop.

25. (a) What are standing waves? Discuss various harmonics of the standing wave along a stretched string.
- (b) A transverse harmonic wave on a string is described by
- $$y = 3.0\sin(36t + 0.018x + \pi/4),$$
- where x and y are in cm and t is in second. Find
- frequency
 - wavelength
 - speed of the wave. 5

OR

- (a) What is Doppler effect in sound? Derive an expression for the apparent frequency when an observer is moving towards a stationary observer.
- (b) A train, running at a speed of 30 ms^{-1} blows a whistle of frequency 400 Hz in still air. What is the apparent frequency of the whistle that a stationary person on the platform observe when
- The train is moving towards the platform and
 - The train is moving away from the platform. Speed of sound in air is 330 ms^{-1} .

26. Draw velocity-time graph of uniformly accelerated motion with initial speed u . Show that the area under this v - t line represents distance travelled. What does the slope of this line represent.

The distance travelled by a body x expressed in meter and time t expressed in second are related by $x = 4t^2 + 6t + 8$, find speed and acceleration of the body at $t = 4$ second.

5

OR

What is uniform circular motion? Obtain an expression for the centripetal acceleration of the body.

If $|\mathbf{a} + \mathbf{b}| = |\mathbf{a} - \mathbf{b}|$, find the angle between vectors \mathbf{a} and \mathbf{b} .

Some important constants:

$$G = 6.67 \times 10^{-11} \text{ Nm}^2\text{kg}^{-2}$$

$$g = 10 \text{ ms}^{-2}$$

$$K \text{ (Boltzmann constant)} = 1.38 \times 10^{-23} \text{ JK}^{-1}$$

$$\text{Mass of the earth} = 6 \times 10^{24} \text{ kg}$$

$$\text{Radius of the earth} = 6400 \text{ km}$$

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GULF SAHODAYA (SAUDI CHAPTER) EXAMINATION - 2016

CLASS – XI

PHYSICS

Time Allowed : 3 hours

Maximum Marks : 70

SET-‘B’

General Instruction:

- (i) *All questions are compulsory.*
 - (ii) *There is no over all choice. However an internal choice has been provided in one question of two marks, one question of three marks, all three questions of five marks.*
 - (iii) *Question number 1 to 5 marks are very short answer type questions, carrying one mark each.*
 - (iv) *Question number 6 to 10 short answer type questions, carrying two marks each.*
 - (v) *Question number 12 to 22 are short type questions, carrying three marks each.*
 - (vi) *Question number 23 is a value based question carrying four marks.*
 - (vii) *Question number 24 to 26 are long type question, carrying five marks each.*
 - (v) *Use of calculator is not permitted. However you may use log table if necessary.*
-
1. Draw Position-Time graph for 1
 - (i) A body dropped from a certain height and falling freely under gravity.
 - (ii) A rain drop falling continuously after attaining terminal velocity.
 2. Liquid drops are spherical. Why? 1
 3. What is kinetic friction? How does it change with the speed of the body? 1
 4. What are concurrent forces? 1
 5. Define accuracy and precession. 1
 6. The observations of voltage and resistance in an electric circuit are $V = 40 \pm 0.2$ volt and $R = 25 \pm 0.25$ ampere respectively. Find the percentage error in the measurement of current in the circuit. 2

OR

Speed of sound in air depends on pressure (P) and density(ρ). By using method of dimension, establish a formula for this speed. Take constant of proportionality $K = 1$.

7. State Clausius statement for second law of thermodynamics? Draw block diagram to represent the working of refrigerator. 2
8. Obtain an expression for the minimum speed required by the body to become satellite of earth, in terms of mass of earth and its distance from the centre of earth. 2
9. What is simple harmonic motion? The displacement of a body in periodic motion is given by $y = y_0 \sin \omega t$. Obtain expression for the acceleration of the body. 2
10. Show that the kinetic energy of a gaseous molecule depend only upon the temperature. 2
11. For a body thrown from ground with speed u at an angle θ with horizontal, Show that $4H_{\max} = R \tan^2 \theta$, where the terms have their usual meaning. 3

OR

Show that the range of a projectile, thrown from ground with speed u at an angle θ with horizontal, is same when projected with same speed but an angle $90^\circ - \theta$ with horizontal. Find the ratio of H_{\max} of the body for these two angle of projection.

12. A ball is thrown vertically upward with a velocity of 20 m/s from the top a building of height 30 m from the ground.
 (a) How high from the ground the ball will reach before returning back?
 (b) How long will the ball take to reach the ground? ($g = 10 \text{ m/s}^2$) 3
13. What is a torque? Show that the rate of change of angular momentum of a particle is equal to the torque acting on it. ($\tau = dL/dt$). 3
14. State theorem of parallel axes. By using this theorem find the expression of moment of inertia of rod of uniform thickness, of mass m and length L about an axis passing through its one end and perpendicular to its length, if its moment of inertia about an axis passing through its centre and perpendicular to its length is $mL^2/12$. 3
15. Show that the value of g decreases with height. At what height, the value of g becomes 4% of its value on earth surface? Radius of earth is 6400 km. 3
16. What is an elastic collision? Two identical spheres moving along same line with speed u_1 and u_2 ($u_1 > u_2$) collide elastically and continue moving on the same line. Show that their speeds are interchanged during this collision. 3
17. Show that the motion of a simple pendulum is simple harmonic. Obtain expression for its time period also. 3
18. What is projectile? A body is thrown from ground with a speed v_0 at an angle θ

19. Why do the gases have two specific heats? Show that $C_p - C_v = R$, where C_p and C_v are molar specific heat capacity of gas at constant pressure and volume respectively, and R is gas constant. 3
20. What is banking of track? Obtain expression for the maximum velocity with which a vehicle can take turn safely over circular smooth banked track. 3
21. A body is dropped from a height h . Show that its total mechanical energy remains constant through out the fall (ignoring air resistance). 3
22. State Law of Equipartition of Energy. Obtain expression for the molar specific heats of a monoatomic gas at constant volume and at constant pressure. 3
23. Nilofar was studying in class 11. Once she noticed that her two year old brother was moving towards gas stove on which her mother kept water which was boiling. She rushed and pulled him back.
- (i) What values of Radha are appreciable?
(ii) Why does steam cause more severe burn than boiling water?
(iii) Calculate the amount of heat absorbed when 100 ml of water is converted into steam at boiling temperature. Latent heat of vaporisation of water is 2250 J/gm. Density of water is 1gm/ml. 4
24. Draw velocity-time graph of uniformly accelerated motion with initial speed u . Show that the area under this v - t line represents distance travelled. What does the slope of this line represent.
- The distance travelled by a body x expressed in meter and time t expressed in second are related by $x = 4t^2 + 6t + 8$, find speed and acceleration of the body at $t = 4$ second. 5

OR

What is uniform circular motion? Obtain an expression for the centripetal acceleration of the body.

If $|\mathbf{a} + \mathbf{b}| = |\mathbf{a} - \mathbf{b}|$, find the angle between vectors \mathbf{a} and \mathbf{b} .

25. State and prove Bernoulli's theorem.
Explain swinging of spinning ball in air by using Bernoulli's theorem. 5

OR

What is excess pressure inside a liquid drop or bubble?

Show that $p_i - p_o = 2S/R$, for a liquid drop, where p_i & p_o are its inside and outside pressures, S is the surface tension and R is the radius of the drop.

26. (a) What are standing waves? Discuss various harmonics of the standing wave along an air column in a hollow pipe with one end close and other end open.
- (b) A transverse harmonic wave on a string is described by
$$y = 3.0\sin(36t + 0.018x + \pi/4),$$
where x and y are in cm and t is in second. Find
(i) frequency (ii) wavelength and (iii) speed of the wave.

5

OR

- (a) What is Doppler effect in sound? Derive an expression for the apparent frequency when both source and observer are moving towards each other.
- (b) A train, running at a speed of 30 ms^{-1} blows a whistle of frequency 400 Hz in still air. What is the apparent frequency of the whistle that a stationary person on the platform observe when
(i) The train is moving towards the platform and
(ii) The train is moving away from the platform.
Speed of sound in air is 330 ms^{-1} .

Some important constants:

$$G = 6.67 \times 10^{-11} \text{ Nm}^2\text{kg}^{-2}$$

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SET-‘C’

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1. Define accuracy and precession. 1
2. Draw Position-Time graph for 1
 - (i) A body dropped from a certain height and falling freely under gravity.
 - (ii) A rain drop falling continuously after attaining terminal velocity.
3. Liquid drops are spherical. Why? 1
4. What is angle of repose? How it is related to coefficient of maximum static friction? 1
5. What are concurrent forces? 1
6. Show that the kinetic energy of a gaseous molecule depend only upon the temperature. 2
7. The observations of voltage and current in an electric circuit are $V = 15 \pm 0.15$ volt and $I = 2 \pm 0.25$ ampere respectively. Find the percentage error in the measurement of resistance in the circuit. 2

OR

Speed of sound in air depends on pressure (P) and density(ρ). By using method of dimension, establish a formula for this speed. Take constant of proportionality $K = 1$

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10. What is simple harmonic motion? The displacement of a body in periodic motion is given by $y = y_0 \sin \omega t$. Obtain expression for the acceleration of the body. 2
11. State theorem of perpendicular axes. By using this theorem find the expression of moment of inertia of ring of mass m and radius R about its diameter if its moment of inertia about an axis passing through its centre and perpendicular to its plane is mR^2 . 3
12. Show that the value of g decreases with depth. At what depth, a 60 kgwt person experiences only 15 kgwt? Radius of earth is 6400 km. 3
13. What is an elastic collision? Two identical spheres moving along same line with speed u_1 and u_2 ($u_1 > u_2$) collide elastically and continue moving on the same line. Show that their speeds are interchanged during this collision. 3
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