

KENDRIYA VIDYALAYA SANGATHAN, LUCKNOW REGION.
SESSION ENDING EXAMINATION 2022-23
CLASS-XI SUBJECT –
PHYSICS

TIME: 3 HR.

MAX.MARKS:70

General Instruction

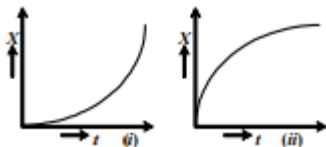
- (1) There are 35 questions in all. All questions are compulsory.
- (2) This question paper has five sections: Section A, Section B, Section C, Section D and Section E. All the sections are compulsory.
- (3) Section A contains eighteen MCQ of 1 mark each, Section B has seven Questions of 2 marks each, Section C contains five questions of 3 marks each, Section D contains three long questions of 5 marks each, and Section E contains two case study based questions of 4 marks each.
- (4) There is no overall choice. However internal choice has been provided in Sections B, C, D and E. You have to attempt only one of the choices in such questions.
- (5) Use of calculator is not allowed. Log tables can be used.

SECTION A

- Q.1 The density of a liquid is 13.6 g cm^{-3} . Its value in S.I. is (a) 13.6 kgm^{-3}
(b) 136 kgm^{-3}
(c) 13600 kgm^{-3}
(d) 1360 kgm^{-5}

- Q.2 The dimensional formula for angular momentum is same as that for:
(a) Torque
(b) Plank's constant
(c) Gravitational constant
(d) impulse

- Q.3 Figures (i) and (ii) below show the displacement-time graphs of two particles moving along the x-axis. We can say that

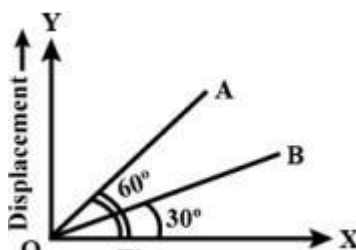


- (a) Both the particles are having a uniformly accelerated motion
(b) Both the particles are having a uniformly retarded motion
(c) Particle (i) is having a uniformly accelerated motion while particle (ii) is having a uniformly retarded motion
(d) Particle (i) is having a uniformly retarded motion while particle (ii) is having a uniformly accelerated motion

- Q.4 Which of the following represents the correct dimension of the coefficient of viscosity?

- a) $M L^{-1} T^{-2}$
b) $M L^{-1} T^{-1}$
c) $M L^{-2} T^{-2}$
d) $M L T^{-1}$

- Q.5 The displacement – time graph of the two particles A and B are shown in the figure. The ratio of their velocities $V_a : V_b$ is



(a) 3:1

(b) $1:\sqrt{3}$

(c) 1:3

(d) $\sqrt{3}:1$

Q.6 A block of mass 100 g is lying on an inclined plane of angle 30° . The frictional force on this block. N. ($g = 9.8 \text{ m/s}^2$)

(a) 4.9×10^{-2}

(b) 4.9×10^{-1}

(c) 4.9×100

(d) 4.9×101

Q.7 If momentum decreases by 20%, K.E. will decrease by

(a) 40%

(b) 36%

(c) 18%

(d) 8%

Q.8 The gravitational force between the two objects is F. If masses of both the objects are halved without altering the distance between them, the gravitational force would become: -

(A) $F/4$

(B) $F/2$

(C) F

(D) $2F$

Q.9 The ratio of the lengths of two wires A and B of same material is 1 : 2 and the ratio of their diameter is 2 : 1. They are stretched by the same force, then the ratio of increase in length will be

(a) 2 : 1

(b) 1 : 4

(c) 1 : 8

(d) 8 : 1

Q.10 One end of a towel dips into a bucket full of water and other end hangs over the bucket. It is found that after some time the towel becomes fully wet. It happens

(A) because viscosity of water is high

(B) because of the capillary action of cotton threads

(C) because of gravitational force

(D) because of evaporation of water.

Q.11 110 J of heat is added to a gaseous system, whose internal energy increases by 40 J. Then, the amount of external work done is

(a) 150 J

(b) 70 J

(c) 110 J

(d) 40 J

Q.12 A gas expands under constant pressure P from volume V_1 to V_2 . The work done by the gas is

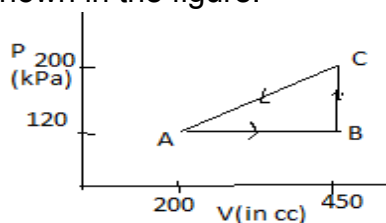
(a) $P(V_2 - V_1)$

(b) $P(V_1 - V_2)$

(c) $P(V_1 - V_2)$

(d) $P(1/V_1 - 1/V_2)$

Q.13 PV diagram of a cyclic process is shown in the figure. Work done by the gas during ABCA as shown in the figure.



(a) 10J

(b) -10J

(c) 20J

(d) -20J

Q.14 The ratio of specific heats of monoatomic gas is

(a) $7/5$

(b) $5/3$

(c) $5/7$

(d) $3/5$

Q.15 Moon has no atmosphere because

(a) RMS velocity of all gases is more than the escape velocity of moon's surface

(b) its surface is not smooth

- (c) Its quite far away from the surface of the earth
- (d) It does not have population

For question number 16,17,18 two statements are given, One labelled Assertion (A) and other labelled Reason (R). Each of these questions also has four alternative choices, only one of which is the correct answer. You have to select one of the codes (a), (b), (c) and (d) given below.

- (a) Both A and R are true and R is the correct explanation of A
- (b) Both A and R are true but R is not the correct explanation of A (c) A is true but R is false.
- (d) A is false and R is also false.

Q. 16 ASSERTION: It is harder to open and shut the door if we apply force near the hinge.

REASON: At the hinges the applied force to produce the required torque is maximum.

Q. 17 ASSERTION: When distance between two bodies is doubled and also mass of each body is also doubled, gravitational force between them remains the same.

R. REASON: According to Newton's law of gravitation, force is directly proportional to Product of mass of two bodies and inversely proportional to square of distance between their centres.

Q.18 ASSERTION: A hollow shaft is found to be stronger than a solid shaft made of same material.

REASON: The torque required to produce a given twist in hollow cylinder is greater than that required to twist a solid cylinder of same size and material.

SECTION B

Q.19 A car of mass 1000kg travelling at 32m/s clashes into rear of a truck of mass 8000kg moving in the same direction with a velocity of 4m/s. After the collision, the car bounces with a velocity of 8m/s. what is the velocity of truck after the impact

Q.20 Check the correctness of the equation .

- (i) $T = 2\pi \sqrt{l/g}$ Where T- time period , l - length and g - acceleration due to gravity
- (ii) $v = \sqrt{P/\rho}$ where v- velocity of sound and P- pressure , ρ - density

Q.21 State Work Energy theorem and prove it for constant force.

Q.22 State and explain Kepler's laws of planetary motion.

Q.23 A wire of length 150 cm and area of cross section 1 mm² is stretched by a weight of 3 Kg. Determine the increase in length. Young's modulus of material of the wire is 2×10^{11} N/m². (g=9.8 m/s²)

OR

Calculate percentage increase in length of wire of diameter 2 mm stretched by a force of 1 Kg weight, Young's modulus of elasticity of wire is 1.5×10^{11} N/m².

Q.24 State Bernoulli's theorem? How it can be used to lift an aircraft wing.

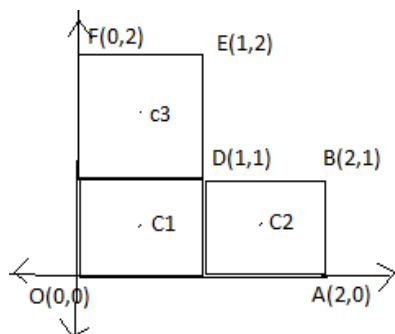
Q.25 Discuss any four factors which affects the speed of sound in gases.

SECTION C

Q.26 What do you mean by banking of curved road? Determine the angle of banking so as to minimize the wear and tear of the tyre of the car negotiating a banked curve.

Q.27 What is perfectly inelastic collision? Show that kinetic energy is invariably lost in such a collision.

Q.28 Find the centre of mass of a uniform L- shaped lamina (a thin flat plate) with a dimensions as shown in fig. The mass of the lamina is 3 kg



Q.29 Define escape velocity. Obtain an expression for the escape velocity of the body from the surface of the earth.

Q.30 The equation of transverse travelling wave is given by $y = 0.05 \sin 2(0.4x - 5t)$ where x and y are in meters and t is in second calculate i) amplitude ii) wavelength iii) angular wave number.

OR

A string of mass 2.5 Kg is under a tension of 200 N. The length of the stretched string is 20 m. If the transverse jerk is struck at one end of the string, how long does the disturbance take to reach the other end?

SECTION D

Q.31 (a) A projectile is fired with a velocity u making an angle θ with the horizontal.

Show that its trajectory follows the parabolic path. Explain it with suitable diagram.

(b) Prove that maximum horizontal range is four times the maximum height attained by the projectile when fired at an inclination so as to have maximum horizontal range.

OR

(a) In projectile motion derive expression for (i) Time of maximum height (ii) Time of flight (iii) maximum height.

(b) In projectile motion show that there are two angle of projections for the same horizontal range.

(c) state and explain first law of thermodynamics

Q.32 (a) On the basis of kinetic theory, derive an expression for the pressure exerted by an ideal gas.

(b) Show that the average kinetic energy of a gas molecule is directly proportional to the temperature of the gas. Hence give the kinetic interpretation of temperature.

OR

(a) State law of equipartition of energy? Using the law of equipartition of energy determine the value of C_p , C_v and γ for (i) Monoatomic (ii) Diatomic gases.

(b) Calculate the internal energy of 1g of oxygen at N.T.P.(given $R=8.31 \text{ Jmol}^{-1}\text{K}^{-1}$)

Q.33 (a) Derive expression for total energy of a particle executing Simple Harmonic motion.

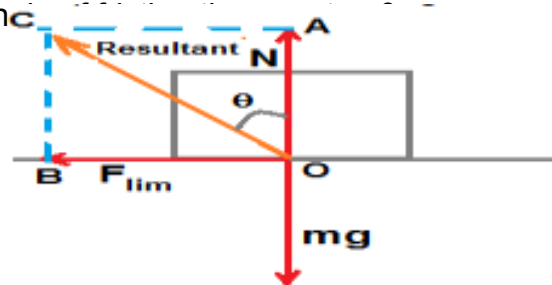
(b) A block whose mass is 1kg fastened to a spring .The spring constant of a spring is 50N/m. The block is pulled to a distance of $x = 10\text{cm}$ from its equilibrium position $x= 0$ cm on a frictionless surface from rest at $t = 0$ s. calculate the kinetic and potential energy of the block.

OR

- Give qualitative discussion of the different modes of vibrations of a close end organ pipe.
- What should the minimum length of an open organ pipe for producing a note of 110Hz? The speed of sound is 330m/s.

SECTION E

Q.34 Friction between any two surfaces in contact is the force that opposes the relative motion between them. The force of limiting friction (F) between any two surfaces in contact is directly proportional to the normal reaction R between them i.e. $F \propto R$ or $F = \mu R$, where μ is coefficient of limiting friction. If θ is an



With the help of passage given above, chose the appropriate alternative for each of following questions:

R.1. The force of 49 N is just able to move a block of wood weighing 10kg on a rough horizontal surface. The coefficient of friction is ($g = 10\text{m/s}^2$)

- 0.49
- 4.9
- 10/49
- 49/9.8

R.2. What would be coefficient of friction if angle of friction is 30°

- $\sqrt{3}$
- 5.77
- 1.577
- 0.577

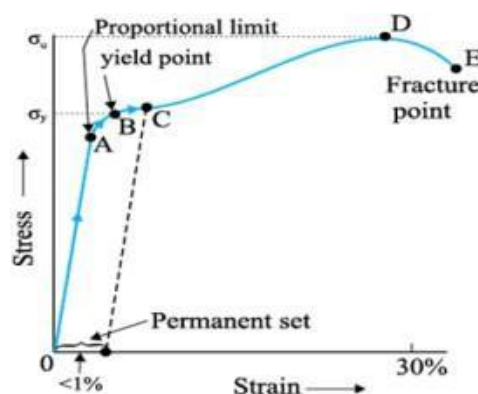
R.3. A horizontal force of 1.2 kgf is applied on a 1.5 kg block which rests on a horizontal surface. If the coefficient of friction is 0.3, force of friction is

- 0.45 kgf
- 1.2 kgf
- 1.5 kgf
- 0.3 kgf

R.4. The acceleration produced in a block in the above question is

- 9.8 m/s²
- 0.3 m/s²
- 1.5 m/s²
- 4.9 m/s

Q.35 For small deformations within elastic limit the stress and strain are proportional to each other. This is known as Hooke's law. Thus, stress $\propto$ strain In the region from A to B, stress and strain are not proportional. Nevertheless, the body still returns to its original dimension when the load is removed. The point B in the curve is known as yield point (also known as elastic limit) and the corresponding stress is known as yield strength (σ_y) of the material.



If the load is increased further, the stress developed exceeds the yield strength and strain increases rapidly even for a small change in the stress. The portion of the curve between B and D shows this. When the load is removed, say at some point C between B and D, the body does not regain its original dimension. In this case, even when the stress is zero, the strain is not zero. The material is said to have a permanent set. The deformation is said to be plastic deformation. The point D on the graph is the ultimate tensile strength (σ_u) of the material. Beyond this point, additional strain is produced even by a reduced applied force and fracture occurs at point E. If the ultimate strength and fracture points D and E are close, the material is said to be brittle. If they are far apart, the material is said to be ductile.

Q 1) Stress is directly proportional to strain this is valid

- (a) Above elastic limit
- (b) Within elastic limit
- (c) Above plastic limit
- (d) None of these

Q 2) SI unit of modulus of elasticity is

- (a) N/m^2
- (b) N
- (c) No unit
- (d) None of these

Q 3) Define modulus of elasticity.

Q 4) State hooks law