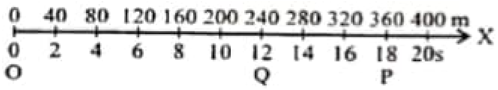
SNBP INTERNATIONAL & Sr. SECONDARY SCHOOL, CHIKHALI, PUNE
Affiliation No. 1130703
TERM II 2024-25
ANSWER KEY

GRADE	SUBJECT	DATE	TIME	MARKS
XI	PHYSICS	10.02.2025	3HRS	70

SECTION A

QI. Multiple Choice Questions. (16Q X 1M = 16M)

1. The dimensional formula of pressure is __________.
   a. $[M L^{-1} T^{-2}]$ b. $[M^2 L^2 T^{-3}]$ c. $[M^3 L^3 T^{-2}]$ d. $[M L^3 T^{-3}]$
   Ans: a
2. SI unit of energy is _________.
   a. Joule b. watt c. Horsepower d. Newton
   Ans: a
3. A car is moving along x axis as shown in figure given below. It moves from O to P in 18 sec and returns from P to Q in 6 sec. What is the average velocity from O to P and come back to O.



   a. 40m/sec b. 20m/sec c. 10m/sec d.30m/sec
   Ans: b.
4. Given a= 2t+5. Calculate the velocity of the body after 5 sec if it starts from rest.
   a. 50m/sec b. 25m/sec c. 100m/sec d.75m/sec
   Ans: d.
5. When a body is dropped from a tower, then there is an increase in its _______.
   a. weight b. acceleration c. velocity d. gravitational potential energy
   Ans: c
6. On which of the following factors moment of inertia of an object does not depend?
   a. axis of rotation b.angular velocity c.distribution of mass d. mass of an object
   Ans: b
7. Escape velocity of an object of mass m is proportional to ________.
   a. m^2 b. m^{-3} c. m^{-1} d. m^0
   Ans: d
8. Which of these laws is called the real law of motion?
   a. Newton's first law of motion. b. Newton's second law of motion
   c Law of momentum d. Law of conservation of mass.
   Ans: b
9. Rolling friction is smaller than ________.
   a. static friction b. fluid friction c. Sliding friction d. All of

these
Ans: d

10. Which of the following is the proper representation of a 10 cm long scale?
a.The scale of the length is 10 cm
b.This is a 10 cm long scale.
c. This a 10 cm long scale.
d. The scale of the length is 10 c.m.
Ans: a
11. Which is a vector quantity?
a. Angular momentum b.work c.potential energy d.electric current
Ans: a
12. The displacement (in metres) of a body varies with time t (in second) as $x = t^2 - t - 3$. The displacement is zero for a positive value of t which is equal to _____.
a.1s b.4s c.3s d.2s
Ans: d
13. During projectile motion horizontal velocity _______.
a. always remains constant b.changes with time c.is always zero d. none of the above
Ans: a

Assertion reason questions: (Q 14 TO Q 16)

Each of these questions contain two statements, Assertion and Reason. 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) Assertion is correct, reason is correct; reason is a correct explanation for assertion.
(b) Assertion is correct, reason is correct; reason is not a correct explanation for assertion
(c) Assertion is correct, reason is incorrect
(d) Assertion is incorrect, reason is correct.

14. Assertion: Aeroplanes are made to run on the runway before takeoff so that they acquire the necessary lift.
Reason: This is as per bernoulli's theorem.
Ans: (a)
15, Assertion : Direction of retardation is opposite to that of velocity.
Reason : Retardation is equal to the rate of decrease of speed with time.
Ans: (a)
16. Assertion : Sound waves cannot propagate through vaccum but light waves can..
Reason : Sound waves are electromagnetic waves.
Ans: (a)

SECTION B

QII. VERY SHORT ANSWER QUESTIONS: (5Q X 2M = 10 M)

17.Subtract 2.17143 from 4.809 and express the result to an appropriate number of significant figures.
Ans: 2.63757 rounded off to 3 decimal places , so answer is 2.638
18. Mention any two properties of vector product.
Ans: **Non-commutative**: The vector product of two vectors is not commutative.

Distributive law: The vector product obeys the distributive law of multiplication.

19. What is Simple harmonic motion?
    Ans: Simple harmonic motion (SHM) is a type of periodic motion where the restoring force is proportional to the displacement. It's a mathematical model for many motions, including the oscillation of a spring.
20. A ball is dropped from a height of 20 meters. Find the time it will take to hit the ground, assuming no air resistance.

    By using the formula:

    $v^2 = u^2 + 2as$

    $v^2 = 0^2 + 2 \times 10 \times 20$

    $v^2 = 400$

    $v^2 = \sqrt{400}$

    $v = 20 m/s$

    For calculating time:

    $V = u + at$

    $20 = 0 + 10 \times t$

    $t = \frac{20}{10}$

    $t = 2$ sec

    The the stone will hit the ground with a velocity of 20 m/s in sec.

    Ans:
21. Two objects of masses M=5 kg and m=2 kg are placed at a distance of r=3m from each other. Calculate the gravitational force of attraction between them. (Given: Gravitational constant $G=6.67\times10^{-11}$ N m^2 kg^{-2})

    Ans: 7.41×10^{-11} N

SECTION C

QIII. SHORT ANSWER TYPE QUESTIONS (7Q X 3M = 21M)

22. State hooke's law and derive an expression for energy stored in a stretched wire.
    Ans: Hooke's Law states that the force applied to an object is directly proportional to the object's change in size or shape. The energy stored in a stretched wire can be derived using Hooke's Law and the concept of work done.

    Hooke's Law F = kx, F is the applied force, k is the spring constant, and x is the displacement of the object.

    The work done = energy stored in stretched string = F.dx
    The energy stored can be found from integrating by substituting for force,
    and we find,

The energy stored = kx2/2, where x is the final elongation.
The energy density = energy/volume
= (kx2/2)/(AL)
=1/2(kx/A)(x/L)
= 1/2(F/A)(x/L)
= 1/2(stress)(strain)

23. Define centripetal acceleration. Find the expression for it. Give one example of centripetal force.
Ans:Centripetal acceleration is the acceleration of an object moving in a circle, and it is always directed towards the center of the circle. The word "centripetal" means "towards the center
24. Derive the equation of motion $v^2 - u^2 = 2as$ by using graphical method.

Ans: From the velocity-time graph , the distances travelled by the object in time t, moving under uniform accelaration a is given by the area .enclosed within the trapezium QABC under the graph. That is,
S = area of the trapezium QABC
=(OA+BC)×OC2
Substituting OA = u, BC = v and OC = t, we get
S=(u+v)t2 ....(5)
From the velocity-time relation [EQ. (4)]
we get
t=(v+u)a
Using Eqs. (5) and (6), we have
A=(v+u)×(v−u)2a
or 2aS=v2−u2

25. The coefficient of friction between the ground and the wheels of a car moving on a horizontal road is 0.5. If the car starts from rest what is the minimum distance in which it can acquire a speed of 72 km/hr. (g =10 m/sec^2)

Ans: Substituting the value of g:
a=0.5·10=5 m/s2

6. Use the kinematic equation to find the distance:
We will use the equation:
v2=u2+2as
where:
- v=20 m/s (final velocity),
- u=0 m/s (initial velocity),
- a=5 m/s2 (acceleration),
- s is the distance we need to find.

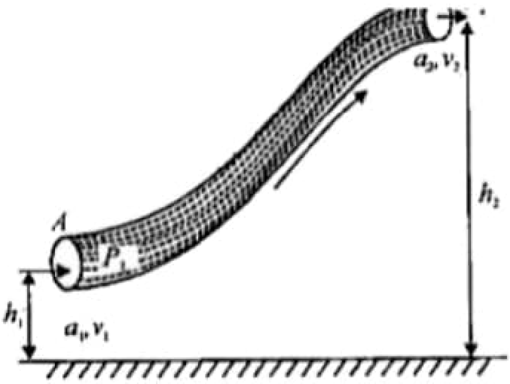
Plugging in the values:
(20)2=(0)2+2·5·s
400=10s

7. Solve for s:
s=40010=40 meters

Final Answer:
The minimum distance in which the car can acquire a speed of 72 km/h is 40 meters.

26. State and prove Bernoulli's principle for the flow of non-viscous fluids and give its limitations.

26. **Ans:** Bernoulli.s theorem
It states that sum of pressure energy, kinetic energy and potential energy per unit mass is always constant. i.e., Pρ+12v2+gh= canstant
Assumptions
i) Liquid is incompressible and non viscous.
ii) Flow of the liquid is steady.
iii) Velocity of the liquid is less than the critical velocity for the liquid.
Proof: Consider an ideal fluid having streamline flow through a pipe. The pipe is having different cross - section.
Let P1,a1,h1,v1 and P2,a2,h2,v2 be the pressure, cross - sectional area, height and velocity at points A and B respectively.
Force acting on fluid at A=P1a1
Work done per second on fluid at A = Force x distance covered by fluid in one second at A
WA=P1a1v1
Similarly, work done per second at B=Force × distance in one second at BWB=P2a2v2
∴ Work done by pressure energy =P1a1v1−P2a2v2
According to equation of continuity.
a1v1=a2v2=mρ
∴W=(P1ρ−P2mρ) ....(i)
Now, increase in potential energy of fluid =mgh2−mgh1 ....(ii)



Increase in kinetic energy of fluid =12mv22−12mv21 ......(iii)
According to the law of conservation of energy.
Work done by pressure energy = Total increase in energy
or P1mρ−P2mρ=(mgh2−mgh1)+(12mv22−12mv21)
or P1ρ+gh1+12v21=P2ρ+gh2+12v22 ......(iv)
or Pρ+gh+12v2=constant ......(v)

OR

A steel rod of length L= 2m and cross-sectional area A=1 cm^2 is subjected to a force F= 4000 N. If the Young's modulus (modulus of elasticity) of steel is $Y=2\times10^{11}$ N/m^2, calculate the elongation of the rod.

Given:

P = 40000 N, Area of rod (A) = 2 cm^2 = 2 × 10^2 mm^2

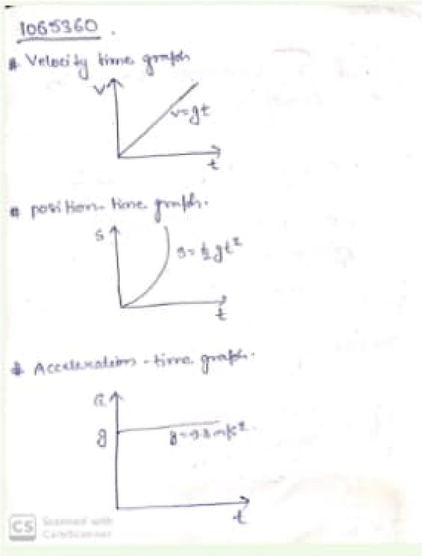
L = 1 m = 1000 mm, E = 2 × 10^5 N/mm^2

Elongation of rod is given by, $\Delta = \frac{PL}{AE}$

$\Rightarrow \frac{40000 \times 1000}{2 \times 10^2 \times 2 \times 10^5} = 1\ mm$

Ans: Δ = 1 mm

27. Draw (a) acceleration - time (b) velocity - time (c) position - time graphs representing motion of an object under free fall. Neglect air resistance.

Ans: 

28. State and explain pascals law.

Ans: Pascal's law states that any pressure change in a confined fluid is transmitted equally throughout the fluid in all directions. This law is also known as Pascal's principle or the principle of transmission of fluid-pressure.

Explanation

Pascal's law applies to fluids that are incompressible, such as liquids or gases.

The law is independent of the shape of the container.

The pressure change is transmitted without loss to the walls of the container.

The pressure at a point in a static fluid is the same across all planes passing through that point.

SECTION D

QIV. LONG ANSWER TYPE QUESTIONS (3Q X 5M = 15M)

29. i. State and derive newton's second law of motion. (3

M)

Ans: Newton's second law can be formally stated as,

The acceleration of an object as produced by a net force is directly proportional to the magnitude of the net force, in the same direction as the net force, and inversely proportional to the mass of the object.

Force = Change of Momentum with change of time

Difference form : $$F = \frac{m_1 V_1 - m_0 V_0}{t_1 - t_0}$$

With constant mass : $$F = m \frac{V_1 - V_0}{t_1 - t_0}$$

Force = mass x acceleration

t = time | X = location | m = mass | V = velocity

ii. Why on a cold day, a brass tumbler feels much colder than a wooden tray?
(2 M)

Ans: A brass tumbler feels colder than a wooden tray on a cold day because brass is a better conductor of heat than wood. This means that heat flows more easily from your body to the brass tumbler, making it feel colder.

30. i.A 10 kg object is lifted vertically to a height of 5 m. Calculate:

a.The work done in lifting the object.
(3M)

Ans: m=10kgm=10kg

30. - h=5mh=5m
- g≈9.81m/s2g≈9.81m/s2

Now, substituting the values into the formula:

Work Done=10kg·9.81m/s2·5m

b. The potential energy of the object at this height. (Take g=9.8 m/s2)
(2M)

Ans: Since,the body is moving upwards,Gravitation Potential Energy is being done which equals to mgh(where m is mass,g is gravitational acceleration(9.81) and h is height) So 10*9.81*5=490.5 Joules.

OR

i.Which of the following examples represent periodic motion?

(3M)

a. A swimmer completing one (return)trip from one bank of a river to the other and back.
b. An arrow released from a bow.
c. Freely suspended bar magnet displaced from the N-E direction and get released.

(b) The motion of a freely-suspended magnet, if displaced from its N-S direction and released, is periodic because the magnet oscillates about its position with a definite period of time.

(c) The swimmer's motion is not periodic. Though the motion of a swimmer is to and fro but will not have a definite period.

(d) An arrow released from a bow moves only in the forward direction. It does not come backward. Hence, this motion is not a periodic.

Ans:

ii. Define: Amplitude, wave number, frequency and time period of a wave.
(2M)

31. i. On a hot day, a car is parked in the sun with all windows closed. Explain why it is significantly warmer inside than outside after some time?
(3M)

Ans: A car parked in the sun with all windows closed is warmer inside than outside because glass allows sunlight to pass through and trap heat inside

ii. An artificial satellite revolves around the earth in 2.5 hrs in a particular orbit. Find the height of the satellite above the earth assuming earth as a sphere of radius 6370 km.
(2M)

Ans: *T*=2πGMR3

where:
T=2.5 hours = 9000 seconds (since 1 hour = 3600 seconds),
G=6.674×10−11m3kg−1s−2 (gravitational constant),
M=5.972×1024 kg (mass of the Earth).

First, convert the satellite's orbital period into seconds (2.5 hours = 9000 seconds). Plugging in the values, we have:

9000=2π6.674×10−11×5.972×1024R3

Solving for R, rearrange the equation:

R3=(2π9000)2×6.674×10−11×5.972×1024R3=(2π9000)2×6.674×10−11×5.972×1024R3= 2.5517×1014

Taking the cube root to solve for R:[/tex]

R=32.5517×1014R≈1.357×107 meters

Convert R to kilometers:

R≈13570 kilometers

Finally, subtract the radius of the Earth from R to find the height h of the satellite above the Earth's surface:

h=R−6370 kilometersh≈13570−6370=7200 kilometers

Therefore, the height h of the satellite above the Earth's surface is approximately 7200 kilometers.

SECTION E

QV. CASE BASED QUESTIONS (2Q X 4M = 8M)

32. Objects get deformed when pushed, pulled and twisted. Elasticity is the measure of the amount that the object can return to its original shape after these external forces and pressure are removed.

The opposite of elasticity is plasticity. When something is stretched, and it stays stretched, the material is said to be plastic. Such deformation is said to be plastic deformation.

In elastic deformation, atoms of the material are displaced temporarily from their original lattice site. They return back to their original position after the removal of external force. In plastic deformation, atoms of the solid are displaced permanently from their original lattice site. They don't return back to the original position even after the removal of external load. So, elastic deformation is temporary, whereas plastic deformation is permanent. Amount of elastic deformation is very small. But the amount of plastic deformation is quite large. External force required for elastic deformation of solid is quite small. Force required for plastic deformation is much higher. Total energy absorbed by the material during elastic and plastic deformation region is called module of toughness. Energy absorbed by the material during elastic deformation is called module of resilience.

Most materials have an amount of force or pressure for which they deform elastically. If more force or pressure is applied, then they undergo plastic deformation. Materials those have a fair amount of plastic deformation before breaking are said to be ductile. Materials those can't stretch or bend much without breaking are said to be brittle. Copper, aluminium, etc. are ductile materials. For this reason those are used for making wires. Glass and ceramics (are often brittle; they will not bend; they will break.

i. Which of the following statements is false?
a. A body is said to be plastic when it deforms due to application of force and returns to to its original shape when the deforming force is removed.
b. External force required for elastic deformation of solid is quite small.
c. In plastic deformation, atoms of the solid are displaced permanently from their original lattice site.
d. Most materials have an amount of force or pressure for which they deform elastically. If more force or pressure is applied, then they undergo plastic deformation.

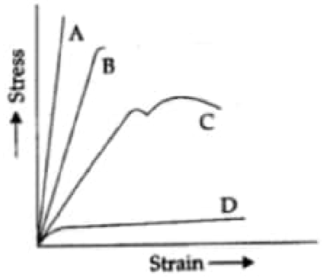
ii. Hooks law is applicable for ______________
a. Plastic materials b.Elastic materials c. Both a and b d. Brittle materials

iii. Aluminium is a ________ material.
a. Brittle b Plastic c. Ductile d. Both a and c

IV. Ceramic is a _______ material.

a. Brittle b. Plastic c.Ductile d. Both a and c

iv. Which of the following 4 stress-strain graphs represent a ductile material ' and a brittle material?



a. A is for a brittle material, B is for a ductile material
b. A is for a brittle material, D is for a ductile material
c. A is for a brittle material, C is for a ductile material
d. C is for a brittle material, A is for a ductile material

33.Longitudinal waves are defined as waves those are capable of displacing the medium in a direction either in the direction of the waves or opposite. Longitudinal mechanical waves are known as compressional waves. This is because these mechanical waves produce a lot of compression and rarefaction while travelling through medium. , These waves are also called pressure waves as there is an increase and decrease in pressure while travelling. Sound waves like vibrations, P-Waves created through earthquakes, etc.. Me some kinds of longitudinal waves. A transverse wave is defined as the wave that moves in the perpendicular direction of the vibration. One of the most important examples of transverse waves includes the waves created by the drum's beating. The membrane of the drum moves perpendicular to the surface. Another example of a transverse wave is light. Transverse wave travels through crests and troughs.

Transverse waves are mostly present in solids those have profound elasticity. In some cases, when there is a deformation in the material, the wave is called a shear wave.

i. Which wave is also known as compressional wave?
a. Longitudinal wave b.Transverse wave c. Both a and b d. None of these

ii. Which wave is also known as shear wave?
a.Longitudinal wave b. Transverse wave c. Both a and b d.None of these

iii. Which wave is also known as pressure wave?
a.Longitudinal wave b. Transverse wave c. Both a and b d.None of these

iv. Which wave produces compressions and rarefactions in the medium?
a. Longitudinal wave b. Transverse wave c. Both a and b d.None of these