AMRITA VIDYALAYAM
ANNUAL EXAMINATION 2018 -'19

Class : XI　　　　　　　　　　　　　　　　　　　　　　　　**Marks : 70**
　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　**Time : 3 hrs**

PHYSICS (042)

GENERAL INSTRUCTIONS:
1. All questions are compulsory.
2. There are 27 questions in total. Questions 1 to 5 carry 1 mark each, questions 6 to 12 carry 2 marks each, questions 13 to 24 carry 3 marks each and questions 25 to 27 carry 5 marks each.
3. There is no overall choice. However, an internal choice has been provided in 1 question of 2 marks, 1 question of 3 marks and all 3 questions of 5 marks each. Only one of the choices in such questions has to be attempted.
*4. Use of calculators is not permitted.*

SECTION - A

1.　Can the relative velocity of two bodies be greater than the absolute velocity of either? When?
2.　What is the angle between the velocity vector and acceleration vector in uniform circular motion?
3.　How escape velocity is related to orbital velocity for orbits close to earth?
4.　Find the ratio of specific heats for a diatomic rigid molecule.
5.　Redraw the diagram given below and mark the position of the centre of curvature of the spherical mirror used in the given set up.

Image
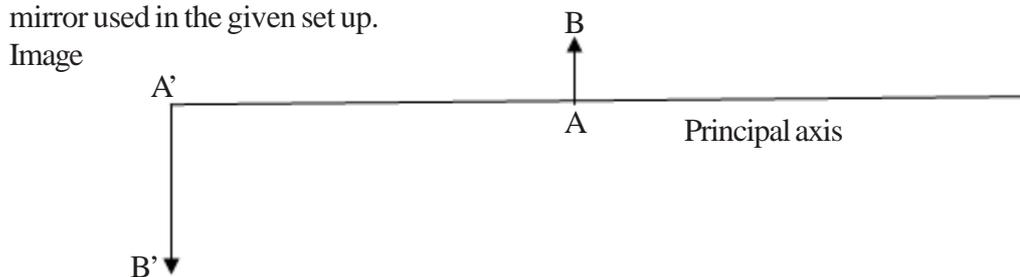
SECTION - B

6.　The two straight rays OA and OB on the same displacement - time graph make angle 30^0 and 60^0 with time axis respectively as shown in figure.
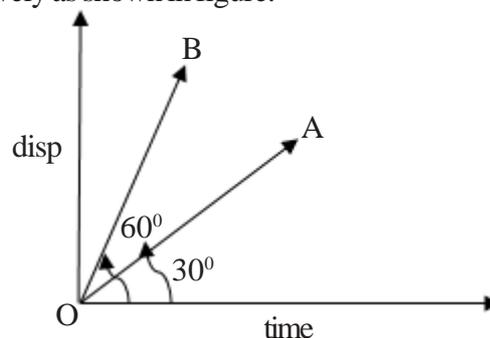
　a) Which ray represent greater velocity?

　b) What is the ratio of two velocities represented by OA and OB?

7.　It is advised not to stand near a running train. Explain with necessary principle in Physics.
8.　State Pascal's law. Explain the working of a hydraulic machine.
9.　What is the kinetic interpretation of temperature?
10.　The displacement of a particle having SHM is $x = 10 \sin [10\pi t + \pi/4]$ m, find

a) Amplitude   b) Angular frequency   c) Time period   d) Frequency

<div align="center">OR</div>

What are standing waves? Discuss graphical method for formation of standing waves on stretched string.

11. Draw a neat, labelled ray diagram of a compound microscope.
12. Prove that the work done per unit volume in stretching a wire for every type of strain is $\frac{1}{2} \times$ stress $\times$ strain.
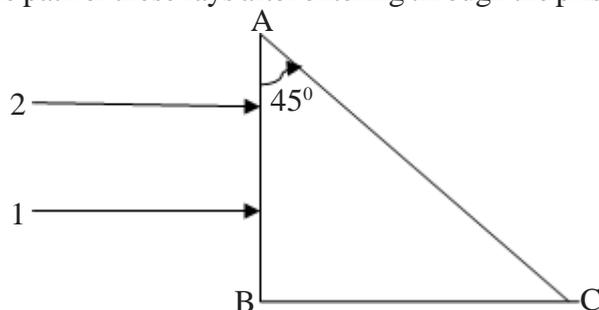
SECTION - C

13. Define uniform circular motion. For uniform circular motion, prove that $v = r\omega$.
14. State Kepler's laws of planetary motion.
15. Describe stress-free strain relationship for a loaded steel wire and hence explain the terms.
    a) Elastic limit   b) Yield point   c) Permanent set   d) Fracture point
16. Establish a relationship for excess pressure on a drop of liquid of surface tension S giving reason for its presence.
17. Two bodies A and B at temperatures 327^0C and 127^0C respectively are placed in an evacuated enclosure maintained at a temperature of 27^0C. Compare their rates of cooling.
18. Show that gravitational potential at a point of distance r from the mass M is given by $V = - GM / r$.
19. Find the total energy of a particle executing SHM and show graphically the variation of potential energy and kinetic energy with time in SHM.
20. Discuss Newton's formula for the velocity of longitudinal wave in air. What correction was applied by Laplace and why?

<div align="center">OR</div>

Derive the expression for pressure exerted by an ideal gas.

21. Obtain a relation connecting object distance u, image distance v and focal length f for a concave mirror with necessary ray diagram.
22. Establish a relation between two specific heats of a gas. Which is greater and why?
23. A Carnot engine absorbs 1000 J of heat energy from a reservoir at 127^0C and rejects 600 J of heat energy during each cycle. Calculate
    a) the efficiency of the engine.
    b) the temperature of the sink.
    c) the amount of useful work done per cycle.
24. Two monochromatic rays of light are incident normally on the face AB of an isosceles right angled prism ABC. The refractive indices of the glass prism for the two rays 1 and 2 are respectively 1.3 and 1.5. Trace the path of these rays after entering through the prism.

SECTION - D

25. A projectile is fired at an angle u with the horizontal.
    a) Show that the trajectory is a parabola.
    b) Obtain the expression for
    (i) Maximum height   (ii) Time of flight   (iii) Horizontal range

<div style="text-align:center">OR</div>

Obtain an expression for acceleration due to gravity. Explain how the value of g varies with the shape of the earth, height h and depth d from the surface of the earth.

26. State and prove Bernoulli's principle. Using it how can you explain the Torricelli's law.

<div style="text-align:center">OR</div>

Describe the working of a Carnot Heat engine. Obtain an expression for its efficiency.

27. Explain the Doppler effect in sound. Find the Doppler frequency when
    a) Source is moving and observer is stationary.
    b) Both source and observer are moving.

<div style="text-align:center">OR</div>

Derive Lens makers' formula from the principle of refraction from a spherical surface.