



ROLL NO.	
NAME	
CLASS & SECTION	

APEEJAY COMMON ANNUAL EXAMINATION, 2018-19

015

CLASS-XI

PHYSICS (042)

Time allowed : 3 hrs.

Maximum Marks : 70

General Instructions :

- All questions are compulsory. There are 27 questions in all. This question paper has four sections: Section A, Section B, Section C and Section D.
- Section A contains five questions of one mark each, Section B contains seven questions of two marks each, Section C contains twelve questions of three marks each, and Section D contains three questions of five marks each.
- There is no overall choice. However, internal choices have been provided in two questions of one mark, two questions of two marks, four questions of three marks and three questions of five marks weightage. You have to attempt only one of the choices in such questions.
- You may use the following values of physical constants wherever necessary.

$$c = 3 \times 10^8 \text{ m/s}$$

$$h = 6.63 \times 10^{-34} \text{ Js}$$

$$e = 1.6 \times 10^{-19} \text{ C}$$

$$\mu_0 = 4\pi \times 10^{-7} \text{ TmA}^{-1}$$

$$1/4\pi\epsilon_0 = 9 \times 10^9 \text{ Nm}^2 \text{ C}^{-2}$$

$$m_e = 9.1 \times 10^{-31} \text{ kg}$$

$$\text{mass of neutron} = 1.675 \times 10^{-27} \text{ kg}$$

$$\text{mass of proton} = 1.673 \times 10^{-27} \text{ kg}$$

$$\text{Avogadro's number} = 6.023 \times 10^{23} \text{ per gram mole}$$

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

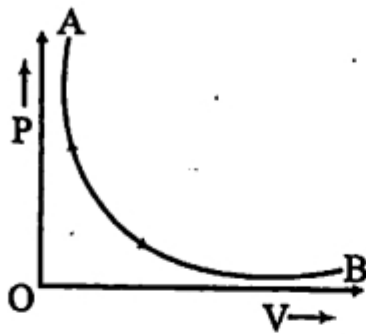
### SECTION-A

- The Earth moving round the Sun in a circular orbit is acted upon by a force, and hence work must be done on the Earth by this force. Do you agree with this statement?

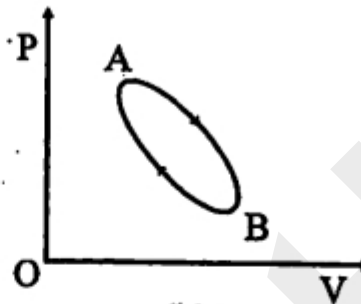
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OR

- Give two examples from your daily life where according to Physics work done is zero. (1)
2. Which of the following processes shown here is reversible? Name the other process. (1)



(a)



(b)

OR

Write the expression of workdone in an (i) adiabatic process (ii) isothermal process.

3. An object is dropped from the top of a tower. Draw its velocity–time graph and displacement– time graph. (1)
4. Two lenses of same mass and same radius are given. One lens is convex and other is concave. Which one will have greater moment of inertia, when rotating about an axis perpendicular to the plane and passing through the centre? (1)
5. Prove that range is same for projection angles  $(45 + \alpha)$  and  $(45 - \alpha)$ . (1)

### SECTION-B

6. Does the function  $y = \sin \omega t + \cos \omega t$  represent a periodic motion? What is the period of the motion?

OR

What is the beat frequency when two tuning forks of frequency 200 Hz and 205 Hz are sounded together? Mention one application of beats. (2)

7. The velocity time relation of an electron starting from rest is given by  $v = kt$ , where  $k = 2 \text{ m/s}^2$ . Calculate the distance travelled in 3 seconds. (2)
8. If the density  $\rho$ , acceleration due to gravity  $g$  and frequency  $\nu$  are the basic quantities, find the dimensions of force in terms of  $\rho$ ,  $g$  and  $\nu$ .

OR

Distinguish between terms precision and accuracy of a measurement with the help of an example. (2)

9. What are conservative and non-conservative forces? Give one example of each. (2)
10. Explain if the ice on the polar caps of the earth melts how will it affect the duration of the day? (2)
11. Explain the principle behind the mirage formation in deserts, with the help of a ray diagram. (2)
12. The acceleration due to gravity on the surface of the moon is  $1.7 \text{ m/s}^2$ . What is the time period of a simple pendulum on the moon if its time period on the earth is 3.5 second?  $g = 9.8 \text{ m/s}^2$ . (2)

### SECTION-C

13. (a) What is Doppler effect?  
(b) A whistle is being rotated in a horizontal circle. What will be the effect on the sound frequency for a listener standing (i) outside the circle (ii) at the centre of the circle. (3)

OR

Explain beats with the help of its graphical diagram? Prove that beat frequency is given by the difference in frequencies of the two sound notes. (3)

14. A rain drop of radius 2 mm falls from a height of 500 m above the ground. It falls with decreasing acceleration (due to viscous resistance of the air) until at half its original height, it attains its maximum (terminal) speed, and moves with uniform speed thereafter. What is the work done by the gravitational force on the drop in the first and second half of its journey? What is the work done by the resistive force in the entire journey if its speed on reaching the ground is 10 m/s. (3)
15. A physical quantity  $X$  is given by :  $X = \frac{P^2 Q^{3/2}}{R^4 S^{1/2}}$ . The percentage error in  $P, Q, R$  and  $S$  are 1%, 2%, 4% and 2%. Calculate the percentage error in  $X$ . (3)
16. Using velocity time graph, prove that  $v^2 - u^2 = 2as$ . Where symbols have their usual meanings. (3)
17. State parallelogram law of vector addition. Show that resultant of two vectors, vector  $A$  and vector  $B$  inclined at an angle  $\theta$  is  $R = \sqrt{A^2 + B^2 + 2AB \cos \theta}$ . (3)
18. What is the turning effect of force called? On what factors does it depend? Derive an expression for the centre of mass of a two particle system. (3)

OR

A meter stick is balanced on a knife edge at its centre. When two coins, each of mass 5g is



put one on top of the other at the 12 cm mark, the stick is found to be balance at 45 cm. What is the mass of the meter stick? (3)

19. A sphere of metal A of 5 kg placed for sufficient time in a vessel containing boiling water, so that the sphere is at  $100^{\circ}\text{C}$ . It is then immediately transferred to 2 kg copper calorimeter containing 1 kg of water at  $20^{\circ}\text{C}$ . The temperature of water rises and attains a steady state at  $50^{\circ}\text{C}$ . Calculate the specific heat capacity of metal A. (Given : Specific heat of copper =  $386 \text{ Jkg}^{-1}\text{K}^{-1}$ , specific heat of water =  $4186 \text{ Jkg}^{-1}\text{K}^{-1}$ ) (3)

OR

Explain what happens when the load on a metal wire suspended from a rigid support is gradually increased. Illustrate your answer with a suitable stress-strain graph.

20. State Bernoulli's principle for the flow of non-viscous fluids. Write its expression. Also explain how Bernoulli's principle helps in explaining the design of wing of aeroplane. (3)

OR

Define angle of contact and Capillarity. Derive an expression for the ascent of a liquid in a capillary tube.

21. A body cools from  $80^{\circ}\text{C}$  to  $50^{\circ}\text{C}$  in 5 minutes. Calculate the time it takes to cool from  $60^{\circ}\text{C}$  to  $30^{\circ}\text{C}$ , the temperature of the surrounding is  $20^{\circ}\text{C}$ . (3)
22. With the help of a block diagram, explain the working principle of a refrigerator and obtain an expression for its coefficient of performance. (3)
23. What are degrees of freedom? Using law of equipartition of energy, find the specific heat capacity of monoatomic and diatomic gas. (3)
24. A prism is made of glass of unknown refractive index. A parallel beam of light is incident on a face of the prism. The angle of minimum deviation is measured to be  $40^{\circ}$ . What is the refractive index of the material of the prism? The refracting angle of prism is  $60^{\circ}$ . If the prism is placed in water predict the new angle of minimum deviation of a parallel beam of light. (3)

#### SECTION-D

25. (a) What is escape velocity? Obtain an expression for the escape velocity on earth.  
(b) What do you mean by rotational and translational equilibrium? Calculate the moment of inertia of a disc of mass  $M$  and radius  $R$  about one of its diameters? (5)

OR

State Kepler's laws of planetary motion. Find the potential energy of a system of four particles each of mass  $m$  placed at the vertices of a square of side  $l$ . Also obtained the potential at the centre of the square.

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