Model Question of HSC Examination 2020 (All Board)

Sub: Physics 1st paper (Creative)

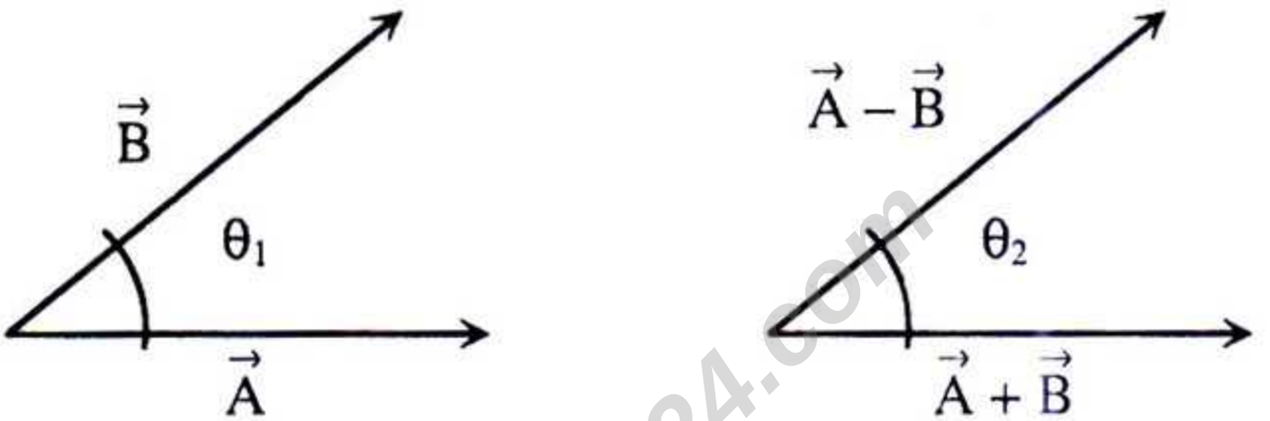
Sub Code : 1 7 4

Time — 2 hours 35 minutes

Full marks: 50

[Answer any five questions.]

1. ✪ Observe the figure and answer the following questions :



$\vec{A} = \hat{i} + \hat{j} + \hat{k}$ and $\vec{B} = 2\hat{i} + 3\hat{j} + 6\hat{k}$

a. What is Position Vector? 1

b. Explaun Curl of a Vector quantity? 2

c. Fine the magnitude of $\ominus_1$ according to stem. 3

d. According to stem, $\theta_1 = \theta_2$ is possible or not— Justified it mathematically. 4

2. ▶ A thin uniform rod of mass 1.75 kg and length 25 cm is rotating around a central axis.

a. What is called angular velocity? 1

b. Explain the relation of torque with moment of inertia & angular acceleration. 2

c. If the axis of rotation goes through the middle point of the rod find the moment of inertia. 3

d. If the axis of rotation is at a distance two-third from one end of rod then determine its moment of inertia & radius of gyration. 4

3. ▶ An artificial satellite is revolving around the earth from a height of 690 km from the ground. The radius of the earth is 6.4×10^3 km & its mass 6×10^{24} kg. $G = 6.67 \times 10^{-11}$ N m^2 kg^{-2}.

a. State Kepler's second law of planetary motion. 1

b. Write down the difference between conservative force and non conservative force? 2

c. Determine the horizontal velocity of the satellite? 3

d. What will be the change in the time period if the satellite is removed to a height of 800 km above the surface of the earth? Explain with mathematical analysis. 4

4. ✪ At normal temperature & pressure the density of oxygen gas is 1.25 kgm^{-3}. According to kinetic theory of gas the velocity of the molecules increases with temperature.

a. What is an ideal gas? 1

b. The temperature of air is 30° and dew point is 20°C what does it mean? 2

c. Calculate the root mean square velocity at 100°C Temperatures? 3

d. If the root mean square velocity of the gas is made 5 times then what will be the change of temperature? Explain mathematically. 4

5. ▶ Two iron balls of radius 2×10^{-4}m and 3×10^{-4} m are allowed to fall through tarpin oil. After attaining the terminal velocity the small ball travels 24 cm in 3.2 s. Densities of tarpin oil and iron are respectively 0.87×10^3 kgm^{-3} and 7.8×10^3 kgm^{-3} and the coefficient of viscosity of tarpin oil is 1.5×10^3 Nm^{-2}.

a. State Hooke's law. 1

b. Steel is more elastic than rubber— Explain. 2

c. Calculate the viscous force on small sphere after it has attained terminal velocity. 3

d. Which sphere will fall first? Give justification of your answer. 4

6. ★ $y = 6 \sin (8\pi t - \pi x/25)$ is the equation of a progressive wave, where x & y are in cm. The wave is travelling through a medium whose density is 0.09 kgm^{-3}.

a. What is progressive wave? 1

b. Explain nodes & antinodes with diagram. 2

c. In the above stem, find the frequency of the wave. 3

d. Is the created wave audible? Justify by determining the intensity levels. 4

7. ▶ Using two engines of 27.36 HP & 3.65 HP, water of 1000 kg is taken above 100m and 10m in 1 min.

a. Define instantaneous velocity. 1

b. Impulse of force is equal to the change of momentum— Explain. 2

c. Calculate the output power of the second engine? 3

d. Show that in the second engine, 20% more energy is wasted than that of the first engine. 4

8. ✪ A second pendulum gives right time on the earth surface; the pendulum is taken to a satellite whose radius is $\frac{1}{4}$ times that of earth & mass is 1/50 times. The mass of earth is 6×10^{24} kg.

a. What is phase? 1

b. Why does a pendulum clock go slow during summer season— explain? 2

c. Calculate the acceleration due to gravity on the surface of the satellite. 3

d. The simple pendulum will move slower on the surface satellite than that on the earth surface. Verify the statement with mathematical analysis. 4

Model Question of HSC Examination 2020 (All Board)

Sub – Physics (MCQ)

Subject Code: | 1 | 7 | 4 |

Time : 25 Minutes

Full Marks : 25

[N.B. Fill the circle of the correct answer with a black ball point pen. Each question bears 1 mark.]

1. For dot and cross product, the range of angle between two vectors is—

ⓐ $0° \le \alpha \le \pi$ ⓑ $0° < \alpha \le \pi$

ⓒ $0° \le \alpha < \pi$ ⓓ $0° < \alpha < \pi$

2. ★ When a solid cylinder of 5cm radius is rotating on its own axis, what will be its radius of gyration?

ⓐ 6.15cm ⓑ 5.25cm

ⓒ 3.5cm ⓓ 2.5cm

3. What is the work done by the centripetal force?

ⓐ 0 ⓑ +ve

ⓒ –ve ⓓ 1

4. If the smallest division of main scale is 1mm and no of vernier division is 20, what is the vernier constant?

ⓐ 0.5mm ⓑ 20mm

ⓒ 0.05mm ⓓ 0.005mm

5. For which condition, incoming & outgoing flux of liquid is equal?

ⓐ Div V = (+ve)

ⓑ Div V = (–ve)

ⓒ Div V = 0

ⓓ Div V = ∞

6. What is the magnitude of F = 5i + 2j – 3k on XZ plane?

ⓐ $\sqrt{13}$

ⓑ $\sqrt{29}$

ⓒ $\sqrt{34}$

ⓓ $\sqrt{38}$

7. ★ A football was kicked at an angle of 30° with the ground and with 30 m/s velocity. What will be the velocity after 1s?

ⓐ $15\sqrt{3}$ m/s ⓑ 5.2 m/s

ⓒ 26.5 m/s ⓓ 24.5 m/s

8. If acceleration is integrated once with respect to time, what will we get?

ⓐ Distance ⓑ Displacement

ⓒ Velocity ⓓ Acceleration

9. What is the range of weak nuclear force?

ⓐ 10^{-17} ⓑ 10^{-15}

ⓒ 10^{30} ⓓ 10^{40}

10. What is the derived quantity?

ⓐ Electric current

ⓑ Temperature

ⓒ Atomic quantity of substance

ⓓ Power

11. 1PF = ?

ⓐ 10^{-9}F ⓑ 10^{-12}F

ⓒ 10^{-15}F ⓓ 10^{-18}F

12. What is the distance of the earth from the sun?

ⓐ 1.49×10^{8} km

ⓑ 4.5×10^{4} km

ⓒ 9.46×10^{12} km

ⓓ 9.46×10^{15} km

13. What is the dimension of gravitational potential?

ⓐ $ML^{-2}T^{-2}$

ⓑ $L^{2}T^{-2}$

ⓒ MLT^{-2}

ⓓ $ML^{2}T^{-1}$

14. The earth moves round the sun in a year at a radius of 1.5×10^{11} m. If the sun's mass is 2×10^{30}kg, then what is the earth's velocity?

ⓐ 10000 m/s

ⓑ 20000 m/s

ⓒ 30000 m/s

ⓓ 40000 m/s

15. If the free surface of water is concave in capillary tube, what is the contact angle?

ⓐ $\alpha > 90°$

ⓑ $90° < \alpha < 90°$

ⓒ $\alpha < 180°$

ⓓ $\alpha < 90°$

16. ★ If the stress and strain of a wire are 2 Nm^{-2} and 1 respectively, what is the work done per unit volume to expand this wire?

ⓐ 2 Pa ⓑ 1 Pa

ⓒ 0.5 Pa ⓓ 0.25 Pa

17. What is the example of non-conservative force?

ⓐ Force of gravity

ⓑ Viscous force

ⓒ Electric force

ⓓ Magnetic force

18. What is the average kinetic energy of ideal gas molecule?

ⓐ 0.5kT ⓑ 0

ⓒ nRT ⓓ 1.5kT

19. ★ Mean free path is—

i. inversely proportional to number of mole per unit volume

ii. inversely proportional to root of molecule's diameter

iii. proportional to pressure and temperature of gas

Which one is correct?

ⓐ i & ii ⓑ ii & iii

ⓒ i & iii ⓓ i, ii & iii

20. How much effective length of a simple pendulum has to be changed in order to increase the time period by 50%?

ⓐ 25% ⓑ 100%

ⓒ 125% ⓓ 225%

$Y = 10\sin 2\pi\left(\frac{t}{0.02} - \frac{x}{15}\right)$ it's a travelling wave. Here length is in cm.

Answer the question no 21 & 22 by using the above equation.

21. Comparing with the general equation of travelling wave– $Y = a \sin\frac{2\pi}{\lambda}(vt - x)$.

i. Amplitude– 10cm

ii. Wavelength– 20 cm

iii. Wave velocity– 750cm/s

Which one is correct?

ⓐ i & ii ⓑ ii & iii

ⓒ i & iii ⓓ i, ii & iii

22. Angular frequency is—

ⓐ 135 rad/s ⓑ 314 rad/s

ⓒ 413 rad/s ⓓ 431 rad/s

23. Cooking rice on Everest summit is tough because of — of water.

ⓐ high pressure and low boiling point

ⓑ high pressure and high boiling point

ⓒ low pressure and high boiling point

ⓓ low pressure and low boiling point

24. What is the maximum rate of change with respect to position?

ⓐ Gradient

ⓑ Divergence

ⓒ Curl

ⓓ Velocity

25. If the square of two same vector's resultant is three times of their product, then what is the angle between them?

ⓐ 0° ⓑ 60°

ⓒ 120° ⓓ 180°

Ans.																										
	1	ⓐ	2	ⓒ	3	ⓐ	4	ⓒ	5	ⓒ	6	ⓒ	7	ⓒ	8	ⓒ	9	ⓐ	10	ⓓ	11	ⓑ	12	ⓐ	13	ⓑ
	14	ⓒ	15	ⓓ	16	ⓑ	17	ⓑ	18	ⓓ	19	ⓐ	20	ⓒ	21	ⓒ	22	ⓑ	23	ⓓ	24	ⓐ	25	ⓒ		