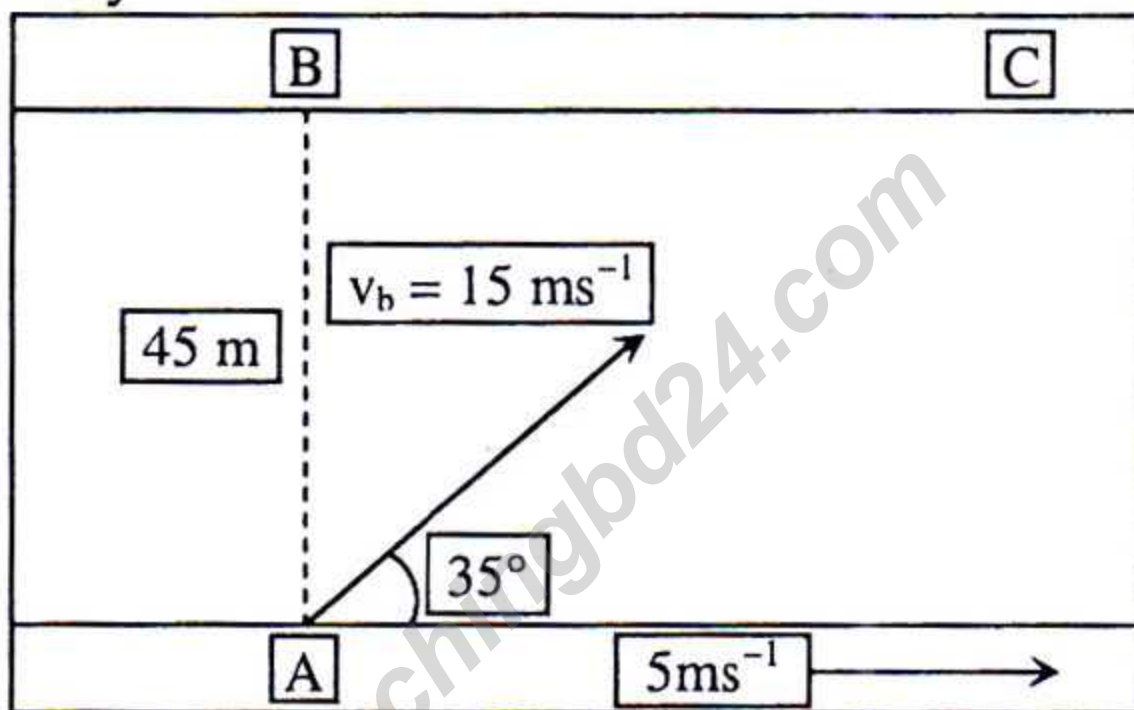


Time — 2 hours 35 minutes

Full marks: 50

[Read the following stems and answer any five of the following questions:]

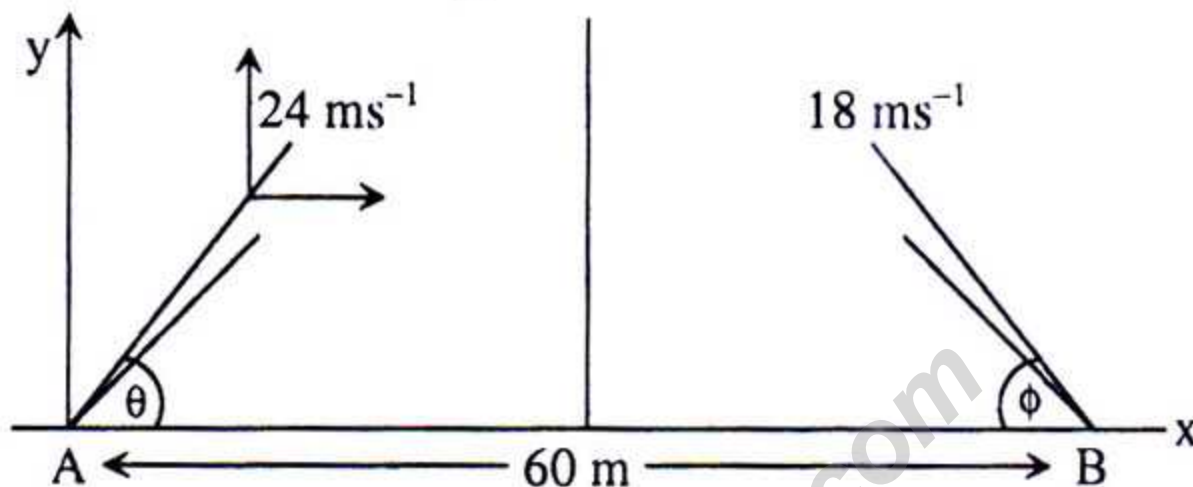
1. ★ A boat is moving with a velocity  $15\text{ms}^{-1}$  in a  $45\text{m}$  wide river. The boat reached at a point C on the other bank of river the current velocity is  $5\text{ms}^{-1}$ .



- What is a vector field? 1
- Explain whether the resultant of two unequal vectors becomes zero. 2
- What is the distance of BC on other bank of the river? 3
- If the velocity of the boat is  $7\text{ms}^{-1}$  and the current velocity is  $9\text{ms}^{-1}$ . Is it possible to reach the boat at B on the opposite Bank of the river? Explain mathematically. 4

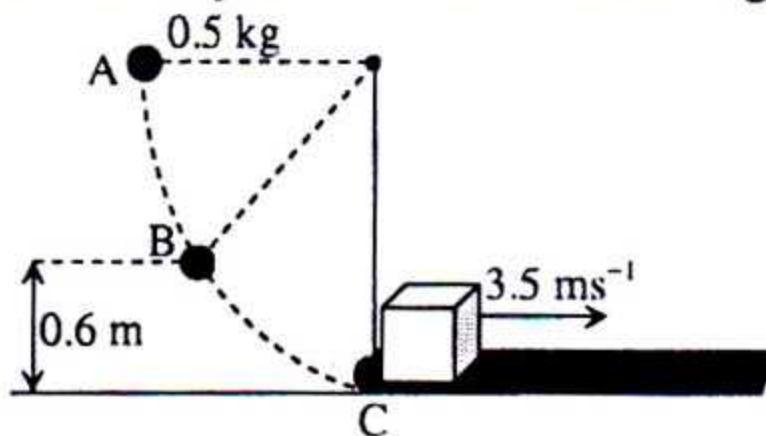
2. ► Two particles, P and Q, are fired simultaneously from points A and B respectively which are located  $60\text{m}$  apart on horizontal ground as shown below. The particle P has an initial speed of  $24\text{ms}^{-1}$  and an angle of projection  $\theta = \tan^{-1}\frac{3}{4}$ . The particle Q has an

initial speed of  $18\text{ms}^{-1}$  with an angle of projection  $\theta$ , where  $\theta = \tan^{-1}\frac{3}{4}$ . The particle Q has an initial speed of  $18\text{ms}^{-1}$  with an angle of projection  $\phi$  where  $\phi = \tan^{-1}\frac{4}{3}$ .

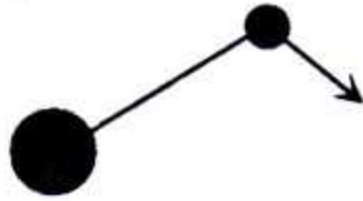


- What is operator? 1
- Why are the handles of trolley bags long in size? 2
- Find out the velocity of the object after 2 second. 3
- Do these particles collide? If so, when and where do they collide? Explain. 4

3. **★** A steel ball of mass  $0.5\text{ kg}$ . It is released from rest at point A, as shown in the figure below. As it passes through point B, which is  $0.6\text{ m}$  above the ground, the magnitude of its velocity is  $3\text{ms}^{-1}$ . As the steel ball swings through its lowest position at point C, it collides with a stationary box of mass  $0.1\text{kg}$ . After the collision, the box moves at a velocity of  $3.5\text{ ms}^{-1}$  to the right.



- a. What is torque? 1
  - b. The earth moves round the sun but why is no work being done? 2
  - c. Calculate the mechanical energy of the steel at point B. 3
  - d. Analytically show the final velocity of the steel ball immediately after the collision. 4
4. ► A satellite is 700 km above from the earth surface. The mass of the earth is  $6 \times 10^{24}$  kg and radius is  $6.4 \times 10^6$  m.



- a. What is escape velocity? 1
  - b. The velocity of any planet increases when it comes closer to the sun-explain. 2
  - c. Find the liner velocity of the satellite. 3
  - d. Does the above satellite is geo-stationary or not? If not how is it possible to covert a geo-stationary satellite. Explain mathematically. 4
5. ★ A second pendulum gives accurate time on the earth surface. (Radius of earth is  $6.4 \times 10^6$  m)
- a. What is periodic motion? 1
  - b. Describe the time period of a simple pendulum at the center of the earth. 2
  - c. Find out the effective length of the pendulum. 3
  - d. If the pendulum is displaced 7000m above from the earth surface what amount of time will be changed in every day in compare with the earth surface? 4

6. ► A iron ball of radius  $2 \times 10^{-4} \text{ m}$  is falling through tarpin oil with a terminal velocity. If the densities of iron and tarpin oil are  $7.8 \times 10^3 \text{ kgm}^{-3}$  and  $0.87 \times 10^3 \text{ kgm}^{-3}$  and coefficient of viscosity of the tarpin oil is  $15.09 \times 10^{-3} \text{ Nsm}^{-2}$ .

- a. What is a capillary tube? 1
- b. Raindrops fall in a constant velocity— explain why? 2
- c. Find out the terminal velocity. 3
- d. If the radius of the iron ball increase 5%. Analytically show that in which situation the upward resistive force i.e. viscous force will increased. 4

7. ★ A transverse harmonic wave on a string is described by  $y(x, t) = 3.0 \sin(36t + 0.018x)$  where  $x$  and  $y$  are in cm and  $t$  in s. The wave progressing throw the water medium of density  $1000 \text{ kgm}^{-3}$ . (Standard intensity  $I_0 = 10^{-12} \text{ Wm}^{-2}$ ).

- a. What is beat? 1
- b. Explain that all harmonic are overtones but all overtones are not harmonics. 2
- c. What are the speed and direction of its propagation? 3
- d. The intensity level will be audible or not. Justified it. 4

8. ► The RMS velocity of nitrogen molecules at NTP is  $497 \text{ ms}^{-1}$ . (For NTP : temperature =  $273 \text{ k}$  and presser =  $1.013 \times 10^5 \text{ N/m}^2$ ).

- a. What is called ideal gas? 1
- b. Explain the principle of equipartition of energy. 2
- c. Calculate the RMS velocity of hydrogen molecules at NTP. 3
- d. What temperature the RMS velocity of nitrogen molecules will be  $994 \text{ ms}^{-1}$ ? Analytically show it. 4

# Model Question of HSC Examination 2020 (All Board)

Sub – Physics (MCQ)

Subject Code: 

1	7	4
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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. ]

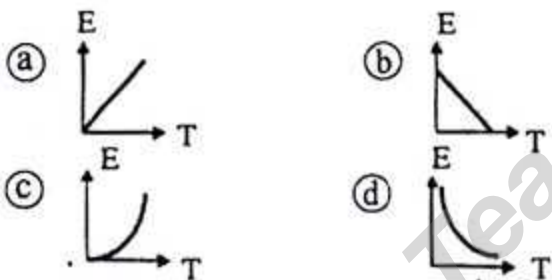
1. A vector  $\vec{A}$  points vertically upward and  $\vec{B}$  points towards south. The vector product  $\vec{A} \times \vec{B}$  will be—

- (a) along west
- (b) along east
- (c) vertically downward
- (d) zero

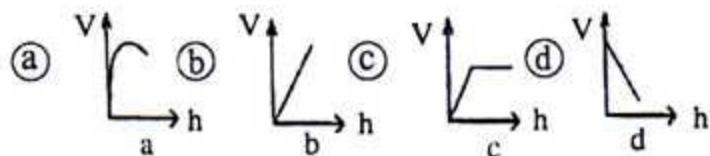
2.  $\hat{i} \times (\hat{k} \times \hat{j}) = ?$

- (a) 0
- (b)  $-\hat{i}$
- (c)  $-1$
- (d) 1

3. Which one of the following Kinetic Energy ( $E$ ) ~ Absolute Temperature ( $T$ ) graphs will be correct with respect to any ideal gas of particular mass at constant temperature?



4. Which of the graph proper in case of an object falling through liquid? ( $v =$  velocity &  $h =$  depth)



5. The vector addition obeys—

- i. Commutative law
- ii. Associative law
- iii. Distributive law

Which one is correct?

- (a) i & ii
- (b) ii & iii
- (c) i & iii
- (d) i, ii & iii

6. Surface tension is the property of which substances?

- (a) Solid
- (b) Liquid
- (c) Gaseous
- (d) Plasma

7. The angle between frictional force and velocity of the object will be—

- (a)  $\pi$
- (b)  $\pi/2$
- (c)  $\pi/4$
- (d)  $0^\circ$

8. The banking angle depends on—

- i. velocity of the object
- ii. Mass
- iii. Radius of inclination

Which one is correct?

- (a) i & ii
- (b) ii & iii
- (c) i & iii
- (d) i, ii & iii

9. When the liquid does not wet the glass, then the angle of contact will be—

- (a) Nearly  $0^\circ$
- (b) near about  $90^\circ$
- (c) Less than  $90^\circ$
- (d) greater than  $90^\circ$

10. What is the unit of torque?

- (a) Nm
- (b)  $mN^{-1}$
- (c)  $Nm^{-1}$
- (d)  $Nm^{-2}$

11. The dimension of coefficient of viscosity is—

- (a)  $MLT^{-1}$
- (b)  $ML^{-1}T$
- (c)  $ML^{-1}T^{-1}$
- (d)  $M^{-1}LT^{-2}$

12. A bullet can penetrate a piece of wood of a particular thickness. How many times should be the velocity of the bullet to penetrate 16 number of such pieces of wood?

- (a) 4
- (b) 8
- (c) 16
- (d) 32

13. If the intensity level of a sound is 100 times the intensity of sound in a class room is  $1 \times 10^{-6} \text{ Wm}^{-2}$ , then what is intensity level in decibel?

- (a) 20 dB
- (b) 30 dB
- (c) 50 dB
- (d) 60 dB

14. The scalar product of two vectors is 18 and the magnitude of the cross product is  $6\sqrt{3}$ . What will be the angle between the vectors?

- (a)  $20^\circ$                       (b)  $28.8^\circ$   
 (c)  $30^\circ$                       (d)  $40^\circ$

15. **★** Characteristics of ideal gas—

- i. Obeys Ideal gas equation  
 ii. Attraction and repulsion between the molecules are available  
 iii. Internal energy at constant temperature does not depend on volume

Which one is correct?

- (a) ii & iii                      (b) i & iii  
 (c) i & ii                      (d) i, ii & iii

16. Gravitational force is a kind of—

- (a) attractive force  
 (b) repulsive force  
 (c) impulsive force  
 (d) additional force

17. Effective length for second pendulum

- (a) 0.993m  
 (b) 0.998m  
 (c) 0.101m  
 (d) 0.102m

18. In case of gravitational potential—

- i. it is scalar quantity  
 ii. it is negative at any point in the gravitational field  
 iii. its dimension  $L^2T^{-2}$

Which one is correct?

- (a) i & ii                      (b) i & iii  
 (c) ii & iii                      (d) i, ii & iii

19. **★** Within elastic limit — always constant—

- i.  $\frac{\text{Stress}}{\text{Strain}}$   
 ii.  $\frac{\text{Lateral strain}}{\text{Longitudinal strain}}$

iii.  $\frac{\text{Force}}{\text{Area}}$

Which one is correct?

- (a) i & ii                      (b) i & iii  
 (c) ii & iii                      (d) i, ii & iii

20. Which one below is an example of oscillatory motion?

- (a) Motion of the hand of a clock  
 (b) Motion of the earth around the sun  
 (c) Motion of an electric fan  
 (d) Motion of a tuning fork

21. Unit of moment of inertia

- (a)  $\text{kgm}^{-2}$                       (b)  $\text{kgm}$   
 (c)  $\text{kgm}^{-1}$                       (d)  $\text{kgm}^2$

22. At what velocity a motor cyclist should move in a circular path of diameter of 50m so that he remains inclined at an angle of  $30^\circ$  with the vertical plane?

- (a)  $9.79\text{ms}^{-1}$                       (b)  $10.89\text{ms}^{-1}$   
 (c)  $11.89\text{ms}^{-1}$                       (d)  $12.98\text{ms}^{-1}$

23. Bond between inert gas molecules is—

- (a) ionic bond  
 (b) covalent bond  
 (c) Vander Waals bond  
 (d) metallic bond

24. Which one is the octave or second harmonic of the fundamental tone?

- (a) 256 Hz  
 (b) 268 Hz  
 (c) 512 Hz  
 (d) 768 Hz

25. The mass of water vapor present per unit volume is called

- (a) humidity  
 (b) absolute humidity  
 (c) relative humidity  
 (d) dew point

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