Sub: Physics 1st paper (Creative)

Sub Code : 1 7 4
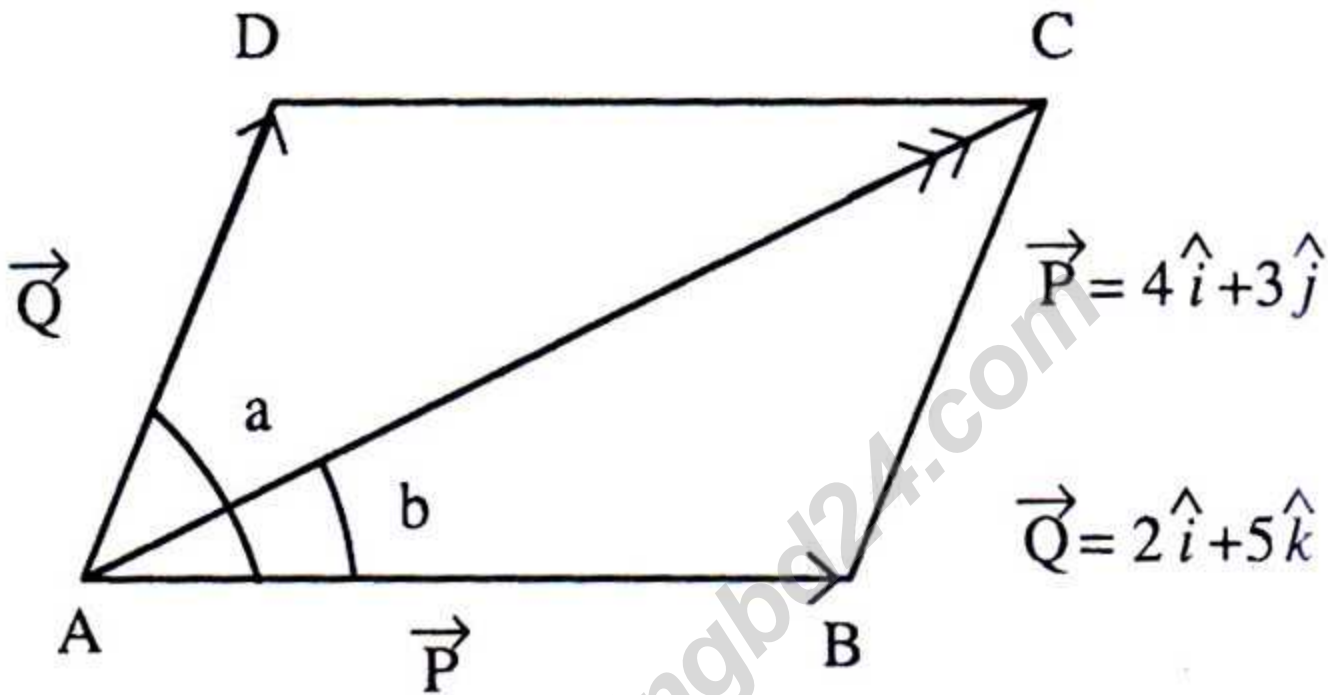
Time — 2 hours 35 minutes

Full marks: 50

[Answer any five questions.]

1. ★

a. State parallelogram law.   1

b. Prove that, scalar multiplication of vectors obey commutative law.   2

c. Find angle b of the stem.   3

d. Analyze mathematically that the area of ABCD is equal or not with the sum of area of triangle ABC and triangle ACD.   4

2. ▶ A train starts from rest with an acceleration $4 m/s^2$ and gets uniform velocity after 3 sec. At the same time a motor car starts moving parallel with an uniform velocity 10m/s. The radius of the wheel of the train is 0.5m.

a. What is average velocity? 1

b. The direction of velocity changes each and every time in spite of the acceleration of the body remains constant—explain. 2

c. Find the number of rotation of the wheel of the train. 3

d. Can the train overtake the car within 10 sec? Show mathematically. 4

3. ★
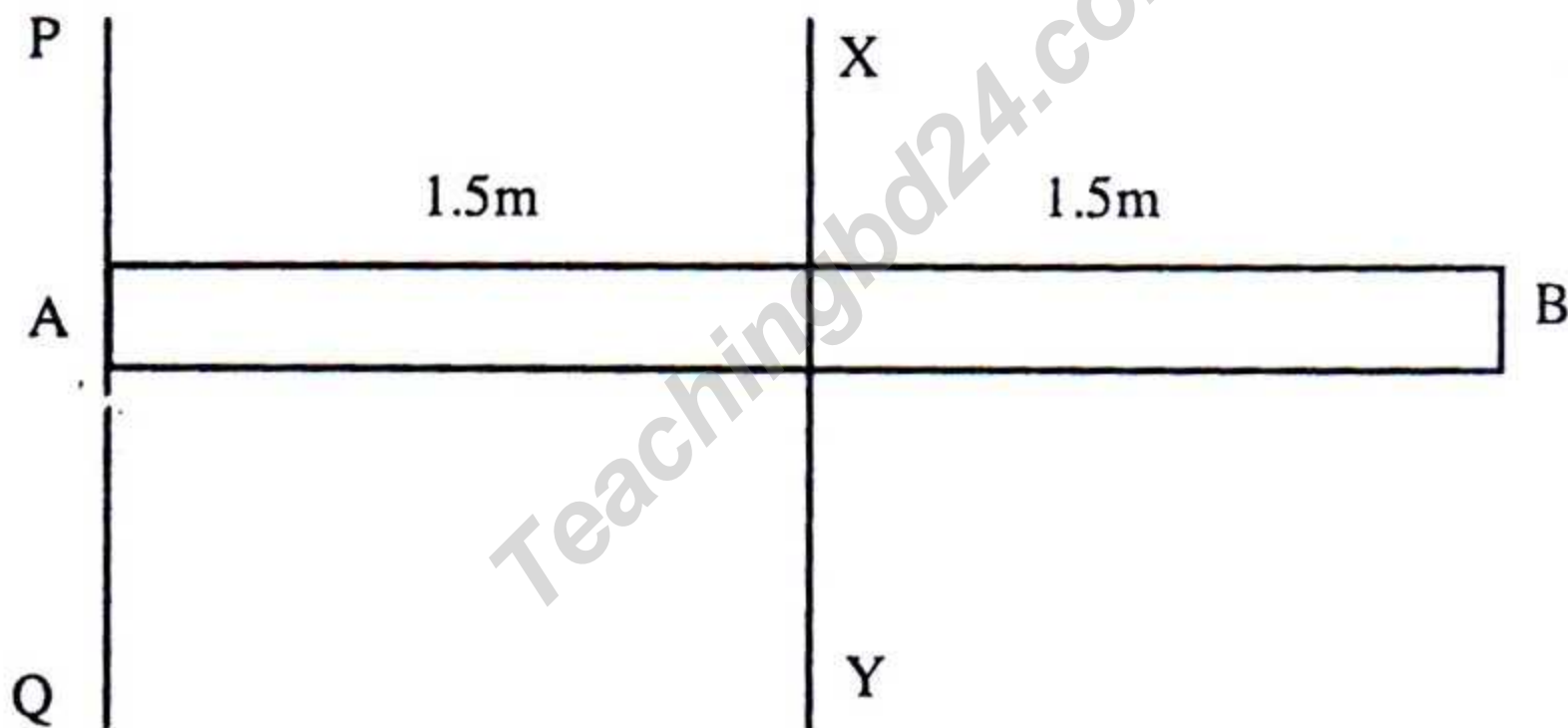
a. What is impulse of force? 1

b. Why a passenger has to bend inward at the turning of a road? Explain. 2

c. Find the radius of gyratior when the bar is rotating through the axis XY. 3

d.   It will be easier to rotate the bar through which axis PQ or XY? Explain mathematically.   4

4. ▶ The depth of a well full of water is 10 m and diameter is 4 m. A pump of 6.87 H.P was fixed to empty the well at 20 min. The pump was disabled after half empty of the well. Then an another pump was fixed and empty the well in the give time.

a.   State work-energy theorem.   1
b.   Prove that, gravitational force is conservative force.   2
c.   After how long the first pump was disabled?   3
d.   Are the power of the two pumps equal— give your logic. 4

5. ✪ An artificial satellite is rotating around the earth. Height of the satellite from the earth is 690km. Mass and radius of earth is 6×10^{24}kg   and 6.4×10^{6}m.

a.   What is parking orbital?   1
b.   Prove that, $E = g$.   2
c.   Find that linear velocity of the satellite.   3
d.   Is there any change of the time period of the satellite if it is transfer to the height 800 km from the earth.   4

6. ▶ The radius of a soap water bubble is increased from 0.01m to 0.1m. Surface tension of the soap solution is 26×10^{-3}N/m.

a.   What is called terminal velocity?   1
b.   The freely falling raindrop does not get high velocity, why?   2

c. Calculate the work done to increase the area. 3

d. Value of Surface energy and surface tension are equal—
show mathematically. 4

7. ▶ Two waves are travelling through a medium. At a certain time the equation of displacement of the waves at a point are $Y_1 = 5 \sin 400\, \pi t$ and $y_2 = 5 \sin 404\, \pi t$.

a. What is restoring force? 1

b. Show that, $x = a \sin \omega t$ is a solution of the differential equation of simple harmonic motion. 2

c. Compare the time periods of the waves. 3

d. It was found that sound is not heard after a definite interval of time— why and how? Explain mathematically. 4

8. ★ 3 gm nitrogen gas of volume $5.7 \times 10^{-4} m^3$, temperature 39°C of mercury pressure height of 0.64m is converted to NTP. The volume and the kinetic energy of the gas is changed. Atomic mass of nitrogen is 28gm and $R = 8.31\ JK^{-1}mol^{-1}$.

a. Define molar gas constant. 1

b. Why dew falls in winter night? 2

c. Calculate the volume of gas at NTP. 3

d. The volume and kinetic energy of gas is changed— analyze mathematically. 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. If $\vec{A} \times \vec{B} = \vec{C}$ denotes—
   i. Normal to $\vec{A}$
   ii. Normal $\vec{B}$
   iii. Normal to $\vec{A}$ and $\vec{B}$
   Which one of the following is correct?
   (a) i   (b) ii
   (c) iii   (d) i, ii & iii

2. ★ If $\vec{P} = \vec{Q}$, $\vec{P} \times (\vec{Q} \times \vec{P})$ = ?
   (a) 0   (b) 1
   (c) P^2Q (d) Q^2P

3. If a body of mass 'm' is in a gravitational field intensity E, force acquired in it will be—
   (a) E/m   (b) Em
   (c) Em^2 (d) E/m^2

4. In case of simple oscillation, x = Asinθ. Here x is—
   (a) Displacement of the particle
   (b) Acceleration of the particle
   (c) Phase difference of the particle
   (d) Velocity of the particle.

5. The path difference between two waves is x and phase difference is δ. Then the relation between them is—
   (a) $x = \frac{\lambda}{2\pi} \times \delta$ (b) $x = 2\pi\delta$
   (c) $x = \frac{\pi}{2\lambda} \times \lambda$ (d) $x = \frac{2\pi}{\lambda} \times \delta$

Two vectors $\vec{A}$ and $\vec{B}$ are acting at a point O at an angle θ. Their scalar product is represented by $\vec{A}.\vec{B}$ and their vector product is represented by $\vec{A} \times \vec{B}$. Answer questions 6 & 7 from the above information :

6. Which is the normal projection of $\vec{A}$ along $\vec{B}$?
   (a) Bcosθ   (b) Acosθ
   (c) Bsinθ   (d) Asinθ

7. The two vectors $\vec{A}$ and $\vec{B}$ of the figure
   i. Dot product obeys communicative law
   ii. Cross product obeys communicative law
   iii. Both dot and cross product obeys communication law .
   Which one of the following is correct?
   (a) only i   (b) ii & iii
   (c) i & ii   (d) i, ii & iii

8. Which one expresses the rotational property of a vector?
   (a) Curl   (b) Divergence
   (c) Gradient   (d) Dot product

9. An object is thrown vertically upwards with a velocity $4.9ms^{-1}$. How long it will be in the space?
   (a) 1s   (b) 2s
   (c) 3s   (d) 4s

10. A particle is moving with a velocity $4ms^{-1}$ in a circular paht of radius 80cm. What is the contripetal acceleration of the particle?
    (a) $4ms^{-2}$ (b) $20ms^{-2}$
    (c) $160ms^{-2}$ (d) $16ms^{-2}$

11. Dimension of momentum—
    (a) MLT   (b) MLT^{-1}
    (c) $ML^{-1}T$ (d) $16ms^{-2}$

12. Banking angle depends on—
    i. velocity   ii. mass
    iii. radius of banking
    Which one of the following is correct?
    (a) only i   (b) ii & iii
    (c) i, ii, iii   (d) i, ii

13. ⭐ For which angle of projection the horizontal range will be minimum.
    ⓐ 30°   ⓑ 45°
    ⓒ 60°   ⓓ 90°

A 5kg object is falling from 250 m height. The air friction is 20N. **Now answer next two questions**

14. The object will obey—
    i. Energy conservation law
    ii. Mechanical Energy conservation law
    iii. Momentum conservation law
    Which one of the following is correct?
    ⓐ only i   ⓑ ii & iii
    ⓒ i & iii   ⓓ i, ii & iii

15. The momentum of an object is made twice then kinetic energy will be—
    ⓐ Half   ⓑ Same
    ⓒ twice   ⓓ four time larger

16. A bullet can penetrate a wooden slice. If the velocity of the bullet is made thrice how many slice of same thickness will be penetrated by the bullet?
    ⓐ 1 slice   ⓑ 3 slice
    ⓒ 6 slice   ⓓ 9 slice

17. The escape velocity of march is
    ⓐ $14.5 kss^{-1}$ ⓑ $11.2 kms^{-1}$
    ⓒ $5.1 kms^{-1}$ ⓓ $3.2 kms^{-1}$

18. ⭐ The velocity of a freely falling body is $100m^{-1}$ at a specific time. What will be the velocity of the object at the next second?
    ⓐ $90.2 ms^{-1}$ ⓑ $98 ms^{-1}$
    ⓒ $109.8 ms^{-1}$ ⓓ $980 ms^{-1}$

19. What is the co-efficient of viscosity?
    i. $Kgm^{-1}s^{-1}$
    ii. Nms^{-2}
    iii. Pas
    Which one of the following is correct?

20. In practical the complete or perfectly elastic body is—
    ⓐ Rubber
    ⓑ Steel
    ⓒ Iron
    ⓓ Glass

21. The properties of liquid are—
    i. Viscosity
    ii. Surface Tension
    iii. Solidity
    Which one of the following is correct?
    ⓐ i & ii   ⓑ i & iii
    ⓒ ii & iii   ⓓ i, ii & iii

Read the stem and answer questions 22 and 23 :
The length of a wire is 5m, radius 1mm, the wire is extended by applying force and its length becomes 5.1m and radius is 0.99 mm.

22. In the stem—
    i. Longitudinal strain 0.02
    ii. Longitudinal strain is negative
    iii. Shearing strain is 0.01
    Which one of the following is correct?
    ⓐ i & ii   ⓑ i & iii
    ⓒ ii & iii   ⓓ i, ii & iii

23. Poison's ratio—
    ⓐ 0.3   ⓑ 0.4
    ⓒ 0.5   ⓓ 0.6

24. ⭐ Co-efficient of viscosity in water to honey is
    ⓐ Less   ⓑ much
    ⓒ equal   ⓓ much less

25. S.I unit of surface energy is—
    ⓐ Jm^{-2} ⓑ Jm^{-1}
    ⓒ Jm^{-3} ⓓ Wm^{-1}

(Above for Q19 also:)
ⓐ ii & iii   ⓑ i & ii
ⓒ i & iii   ⓓ i, ii & iii

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	ⓐ		