Jashore Board-2017

Sub: Physics 1st paper (Creative)

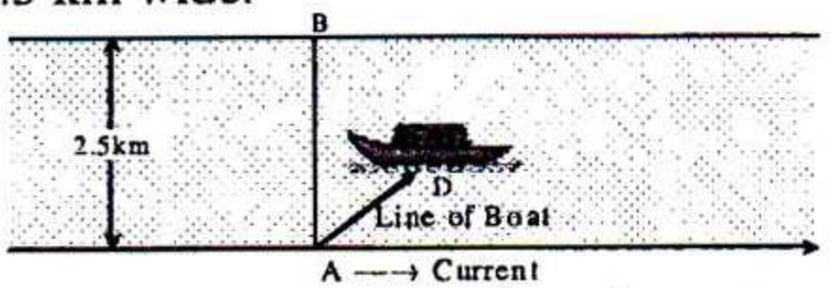
Sub Code : 1 7 4

Time — 2 hours 35 minutes

Full marks: 50

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

1. ▶ A boat is crossing a river from point A along AD where the river is 2.5 km wide.



Boat's velocity in calm water = $(3\hat{i} + 3\hat{j})$ ms^{-1} and velocity of current = $2\hat{i}$ ms^{-1}, in another case the boat goes along AB at same velocity.

a. What is free vector? 1

b. When the work done by restoring force will be negative? Explain. 2

c. Determine the unit vector along river surface's perpendicular. 3

d. According to the stem, in which case the boat will reach the other bank faster? Explain mathematically. 4

2. ★ A golf player in (i) and (ii) conditions, hit the ball from point O to put the golf ball in the hole.

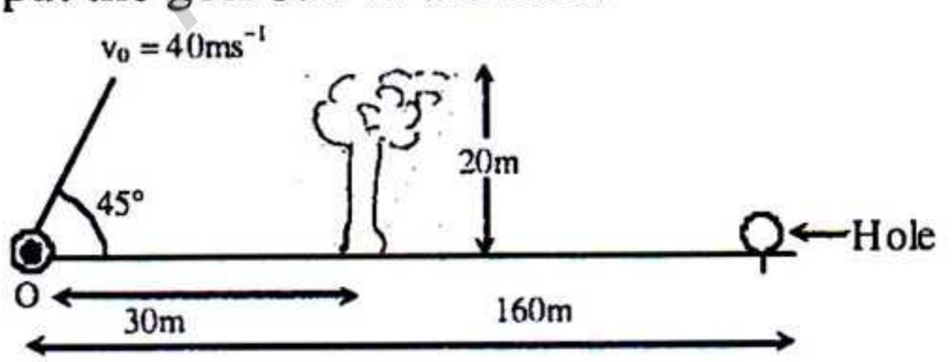


Figure-(i)

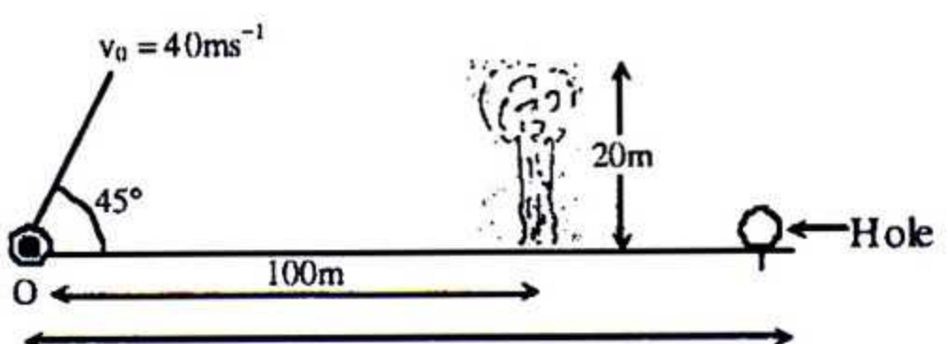


Figure-(ii)

a. What is gravitational intensity? 1

b. What do you understand by- An object's angular acceleration is 3 rad s–2? 2

c. What will be the ball's velocity after 2 sec? 3

d. For which figure mentioned in the stem, the ball will fall in the hole? Explain mathematically. 4

3. ★ A 30 gm marble hit another stationary marble at 10 ms^{-1} velocity. After the collision, first marble lost its 75% velocity, the latter marble gained 9 ms^{-1} velocity and hit a clay wall at 3m distance. The obstructing force of the wall is 3N. (Ignoring the air resistance)

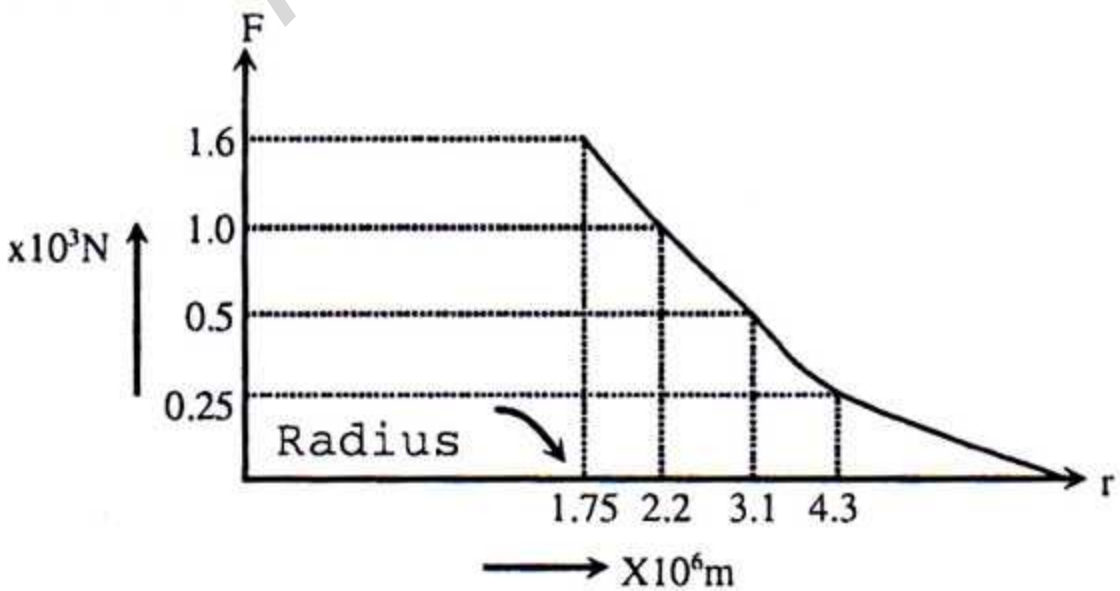
a. What is elastic fatigue? 1

b. Explain if all measurement apparatus have backlash error. 2

c. Determine the mass of stationary marble. 3

d. Mathematically analyse if the marble can enter into the wall. 4

4. ▶ In the graph the change of gravitational force F is shown for a 1000kg object at different distances with the distance from the centre of the moon r.



Given that, radius of earth is 6.4×10^6m, Gravitational acceleration on earth is $g = 9.8\ ms^{-2}$;
$G = 6.67 \times 10^{-11} Nm^2\ kg^{-2}$

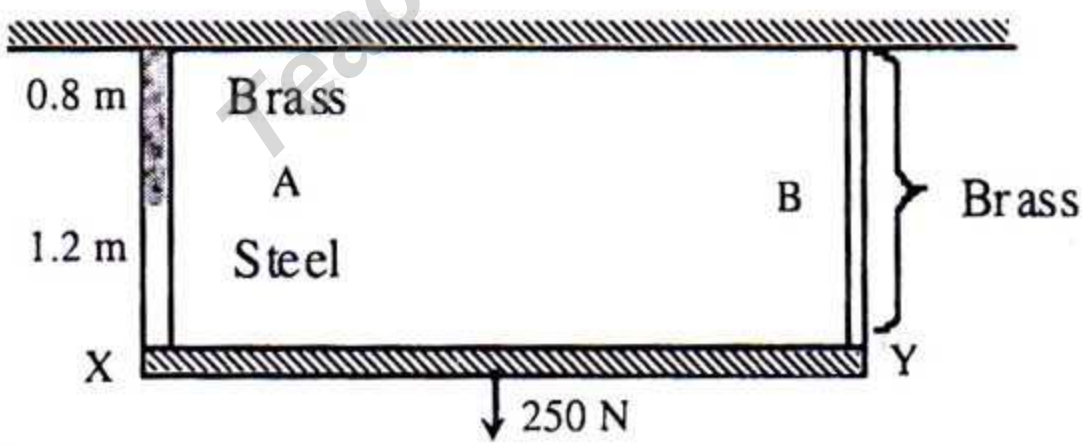
a. Write down second law of Kepler regarding planetary motion. 1

b. Explain why there is no torque with the rotation of Earth. 2

c. Determine the mass of Moon based on the information above. 3

d. Based on the given data, compare the gravitational force working on the object if it is kept at 2.55×10^6 m height from earth and moon. 4

5. ▶ A heavy 250N symmetrical object XY is hanged from two equally long wires A and B horizontally. It is shown in the diagram (uncompressed state). Cross sectional area of each wire is $2.5 \times 10^{-7} m^2$. B wire's longitudinal strain is 2.5×10^{-4}, A wire's 0.8m is made of brass and the rest is steel.
Young's modulus for steel $= 2 \times 10^{11}$Pa
Young's modulus for brass $= 1 \times 10^{11}$Pa



a. Write down the dimension equation of viscosity coefficient. 1

b. How will be a simple pendulum's oscillation at the centre of earth? 2

c. Determine the energy stored in unit volume of B wire. 3

d. Which end of the bar will be lower than another? Check. 4

6. ▶ Mass of a simple pendulum's bob is 1.2×10^{-2}kg. It is swinging at an amplitude of 51 mm. It takes 49.75 sec to complete 25 oscillation. Radius of earth is 6.4×10^{6}m.

a. What is the Conservation of Mechanical Energy? 1

b. Explain the absorption of water by a tissue paper. 2

c. Determine the length of the pendulum. 3

d. If the pendulum is taken at 53760 m height from earth surface than explain the change in restoring force for maximum displacement of the bob. 4

7. ▶ Equation of two sound wave in air is given below:

$$Y_1 = 0.25 \times 10^{-2} \sin 16.35(105.1\pi t - x)$$

$$Y_2 = 0.25 \times 10^{-2} \sin 110(15.764\pi t - 0.15x)$$

Here all units are expressed in SI system. Density of air is 1.29 kg m^{-3}.

a. What is resonance? 1

b. Why not all overtone of diatonic scale are harmonic? Explain. 2

c. If both waves are sounded together determine the number of bit it creates. 3

d. With intensity level explain if the sound made by the second wave is suitable for hospitals. 4

8. ✪ A student keeping the pressure constant, increased the temperature of some O_2 gas which was initially in ideal temperature. So, the volume doubled. And so his friend said that the mean square velocity of the molecules of experimented gas will be doubled too.

a. What is impulse of force? 1

b. Explain the change in velocity if a stationary heavy object is hit by a light moving object. 2

c. Determine the final temperature. 3

d. Mathematically check the truthiness of the comment that the friend made. 4

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. ★ Value of gravitational acceleration changes for —

i. Height
ii. Orbital rotation of earth
iii. Earth's rotation on its own axis

Which one is right?

ⓐ i and ii ⓑ i and iii
ⓒ ii and iii ⓓ i, ii and iii

Mass of an object is (100kg ± 2%) and volume is ($10m^3 \pm 3\%$).

Answer questions 2 and 3 based on the information:

2. What is the percentile error for that object's density?

ⓐ 10 ⓑ 5
ⓒ 0.5 ⓓ 0.1

3. Which is the correct value of the absolute error for that object's density?

ⓐ $5kgm^{-3}$ ⓑ $5gmm^{-3}$
ⓒ $0.5kgm^{-3}$ ⓓ $0.5kgft^{-3}$

4. ★ Dew is–

ⓐ Water drop ⓑ Temperature
ⓒ Heat ⓓ Moisture

An object is thrown at 60° with horizontal and at $10ms^{-1}$ velocity.

Answer questions 5 and 6 based on the information.

5. What is the horizontal velocity?

ⓐ $3ms^{-1}$ ⓑ $4ms^{-1}$
ⓒ $5ms^{-1}$ ⓓ $6ms^{-1}$

6. What is the ratio between potential and kinetic energy at peak height?

ⓐ 1:2 ⓑ 1:1
ⓒ 3:2 ⓓ 3:1

7. ★ Which one is a general characteristics of substances?

ⓐ Surface energy
ⓑ Viscosity
ⓒ Elasticity
ⓓ Surface tension

8. The time period ratio for two artificial satellites of R and 4R radius which are rotating in a circular orbit would be –

ⓐ 8:1 ⓑ 4:1
ⓒ 1:4 ⓓ 1:8

9. Action and reaction forces are $\vec{F}_1$ and $-\vec{F}_2$. So, —

i. $\vec{F}_1 = -\vec{F}_2$
ii. $|\vec{F}_1| = |\vec{F}_2|$
iii. $\vec{F}_1 . \vec{F}_2 = F_1F_2$

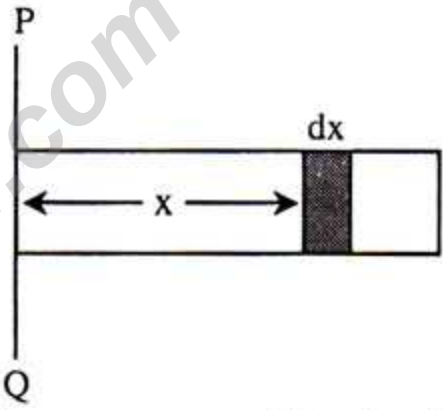
Which one is correct?

ⓐ i and ii ⓑ i and iii
ⓒ ii and iii ⓓ i, ii and iii

10. 'PV' quantity, for a gas expresses —

ⓐ Energy ⓑ Power
ⓒ Momentum
ⓓ Inertia

Answer questions 11 and 12 based on the information below:



In the diagram, mass and length of the thin and symmetrical rod is c. and L.

11. Which one is the mass of the smallest portion of the rod, dx?

ⓐ $ML^{-1}x$ ⓑ MLx^{-1}
ⓒ $ML^{-1}dx$ ⓓ $MLdx$

12. Which one is the integral expression of momentum of inertia with respect to PQ rotational axis?

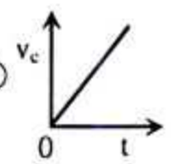
ⓐ $\frac{M}{L}\int_0^L x^2dx$
ⓑ $\frac{M}{L}\int_0^L xdx$
ⓒ $\frac{M}{L}\int_0^L x^{-1}dx$
ⓓ $\frac{M}{L}\int_L^0 x^{-2}dx$

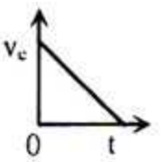
13. For which intermediary angle of force and displacement there will be work done by the force?
ⓐ 60° ⓑ 120°
ⓒ 180° ⓓ 210°

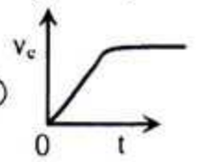
14. ★ A fan is rotating 30 times per minute. What will be its angular velocity?
ⓐ $\pi rads^{-1}$
ⓑ $2\pi rads^{-1}$
ⓒ $15\pi rads^{-1}$
ⓓ $60\pi rads^{-1}$

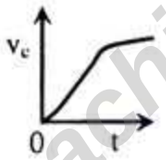
15. A particle's harmonic motion equation is —
$x = 10 \sin (6\pi t + 3\pi)$. What is the frequency?
ⓐ 1.5Hz ⓑ 3Hz
ⓒ 6Hz ⓓ 10Hz

16. A graph of final velocity versus time is given for an object drowning in water. Which is correct?

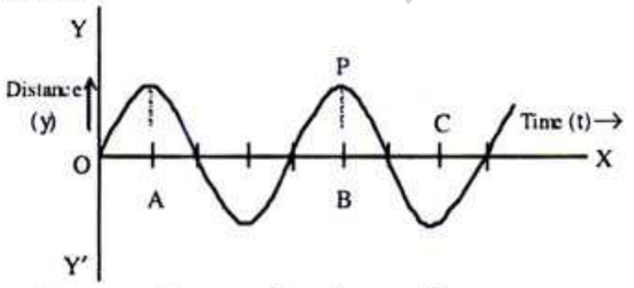
ⓐ 

ⓑ 

ⓒ 

ⓓ 

Answer 17 and 18 based on the stem below:



A forward wave is given above.

17. The phase difference between O and P is-?
ⓐ $\frac{\pi}{2}$ ⓑ $\frac{3\pi}{2}$
ⓒ $\frac{5\pi}{2}$ ⓓ $\frac{7\pi}{2}$

18. In the diagram, the ratio of path difference of A and C with respect to P is?
ⓐ 3:4 ⓑ 3:2
ⓒ 2:1 ⓓ 4:3

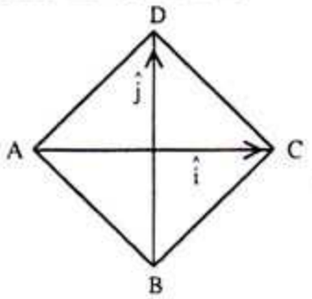
19. The time period of a pendulum clock in summer is 2.002sec. How slow will the clock be in an hour?
ⓐ 2.5s ⓑ 3.6s
ⓒ 4.5s ⓓ 6.6s

20. Level error is applicable for which one?
ⓐ Screw gauge
ⓑ Metre scale
ⓒ Optical spectroscope
ⓓ Spherometer

21. In a river with current, to cross the river at least time at which angle with current should be the boat rowed?
ⓐ 45° ⓑ 60°
ⓒ 90° ⓓ 120°

22. Accuracy of measurement is related with?
i. Error
ii. Apparatus
iii. Mistakes
Which of the following is correct?
ⓐ i and ii ⓑ ii and iii
ⓒ i and iii ⓓ i, ii and iii

Based on the diagram below answer questions 23 and 24:



The diagonals are $\vec{AC} = \hat{i}$ and $\vec{BD} = \hat{j}$

23. $\vec{AB}$ vector's right form is-?
ⓐ $(\hat{i} + \hat{j})/4$ ⓑ $(\hat{i} - \hat{j})/2$
ⓒ $(\hat{i} + \hat{j})/2$ ⓓ $(\hat{j} - \hat{i})/2$

24. ABCD parallelogram's area is-?
ⓐ 0.5 unit ⓑ 1.0 unit
ⓒ 1.5 unit ⓓ 2.0 unit

25. Which one is the dimension equation of impulse of force?
ⓐ $ML^{-1}T^{-2}$ ⓑ MLT^{-1}
ⓒ MLT^{-2} ⓓ $M^{-1}LT^{-2}$

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	ⓑ		