Sylhet Board-2017

Sub: Physics 1st paper (Creative)
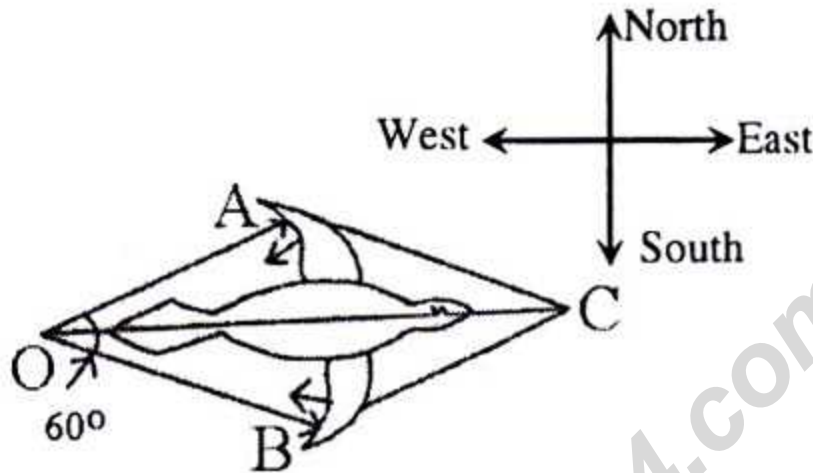
*[Read the following stems and answer **any five** of the following questions:]*

1. ▶

A bird is flying in parallel with land like the diagram above. The amount of push generated by both wings is 5N.

a. What is Curl? 1

b. How our walking by foot is explained by vector resolution? 2

c. What is the reactionary force along OC of the diagram above? 3

d. If the amount of push is doubled along AO then in which direction would the bird fly? Explain mathematically. 4

2. ★ Two cars A and B started their journey with velocity of $v_A = 0$ and $v_B = 22.5 ms^{-1}$. And for the first 15 second their acceleration rate was $a_A = 1 ms^{-2}$ and $a_B = -1 ms^{-2}$. Later both cars went on for 15 more seconds at uniform velocity.

a. What is instantaneous velocity? 1

b. Why the velocity at the highest point of a projectile trajectory is lowest? Explain. 2

c. After starting journey when the velocity of both car will be same? 3

d. Which car will cover more distance? Give your opinion with mathematical analysis. 4

3.▶ The intermediary distance between two rails of meter-gauge and broad-gauge rail line is 0.8m and 1.3m respectively. Where the radius of turning is 500m there the difference between the heights of line is 7.00 cm and 11.37 cm respectively.

a. What is torque? 1

b. 'If two objects of equal mass falls into an elastic collision they exchange velocity'–Explain. 2

c. What is the banking angle for first line? 3

d. In which line the train can turn more quickly- Give your opinions with mathematical analysis. 4

4. ✪ Adiba was working with a simple pendulum (like the diagram) in lab. She found that for a specific displacement, that pendulum's kinetic energy and potential energy is same from the equilibrium.

$A = CD = 0.03m$

$V_{max} = 0.1 \ ms^{-1}$

$W = mg$
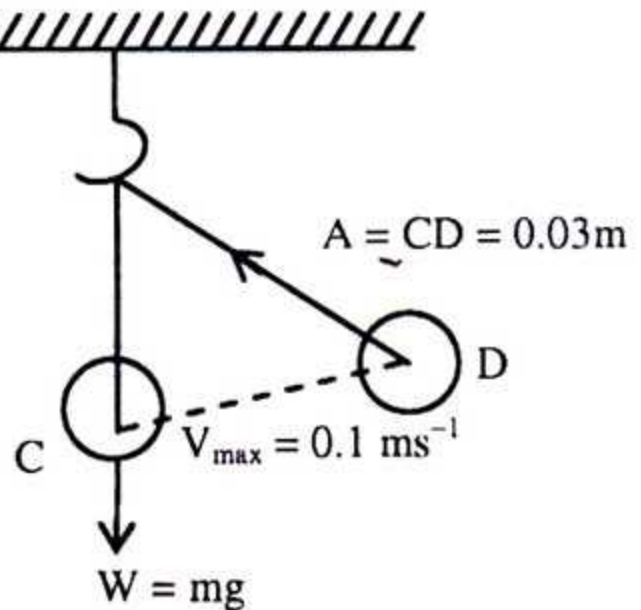
a. What is periodical motion? 1

b. Why in a periodic motion the initial phase angle is constant? Explain. 2

c. Determine the time period of the mentioned simple pendulum. 3

d. Explain mathematically if the conclusion that Adiba found out is acceptable or not. 4

5. ▶ Liana, a student of physics took two tuning fork and saw that on one 312 Hz is inscribed. She sounded both tuning fork at the same time and heard 6 bits. Now she curled a wire on the unidentified tuning fork. She heard the same number of bits as she sounded this one. Here, the velocity of sound from the known identified tuning fork is measured as 3.40 ms^1.

a. What is wave front? 1

b. Why the energy at the motionless point of a stationary wave is zero? Explain. 2

c. After completing how many complete vibrations does the sound generated from identified tuning fork covers 130m distance? 3

d. Did Liana find any difference in the frequency of unidentified tuning fork before and after she added the extra mass? Explain mathematically. 4

6. ★ Temperature of a room is 32°C, dew point is 14°C and relative humidity is 48%. At that time temperature outside was 11°C and relative humidity was 70%. Saturated vapour's pressure at 32°C and 11°C temperature is 33.6mmHg and 9.8mmHg and glacier constant at 30°C is 1.63.

a. What is Root mean square velocity? 1

b. Explain the necessity of pure mercury pillar to determine ideal pressure. 2

c. In that room, for moist and dry bulb hygrometer, what will be the temperature reading of moist bulb? 3

d. If a window is opened then at which direction will the vapour flow? 4

7. ▶ Artificial satellite of a planet is rotating in a circular orbit at 7.8k ms−1 velocity where gravitational acceleration is 9.0ms−2. The ratio of mass and radius of another planet and the one mentioned here is 80:1 and 4:1.

a. What is gravitational constant? 1
b. Why objects weigh less at equinoctial region? 2
c. Determine the height of circular orbit. 3
d. If a spaceship travels between these two planets from which planet will require more kinetic energy for launching? Give opinions with mathematical explanation. 4

8. ▶ As a weight is attached with a wire, its length doubled and diameter became one-third of original.

Element	Y-value
Aluminium	7×10^{10} Nm−2
Iron	11.5×10^{10} Nm−2
Copper	13×10^{10} Nm−2
Steel	20×10^{10} Nm−2
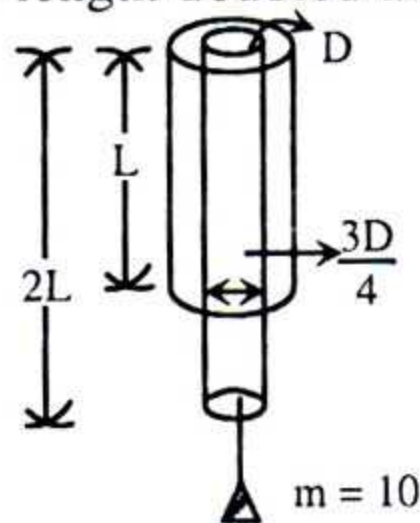
a. What is elastic limit? 1
b. Temperature of stored O_2 gas in two cylinders is 20°C and 25°C respectively. Which gas has more viscosity? Explain with proper reasons. 2
c. Determine the Poisson's ratio for mentioned wire. 3
d. If diameter of wire = 4.22 × 10−2 mm then according to the information given in stem the wire is made of which element? Give your opinion with mathematical analysis. 4

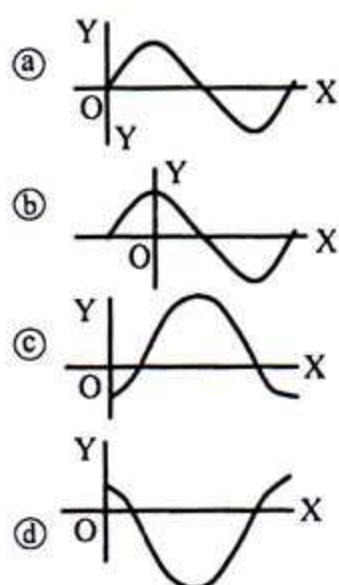[*N.B. Fill the circle of the correct answer with a black ball point pen. Each question bears 1 mark.*]

1. Which one is sound intensity level in decibel unit?

   ⓐ $\beta = \log \frac{I}{I_0}$ ⓑ $\beta = 10 \log \frac{I}{I_0}$

   ⓒ $\beta = \frac{I}{I_0} \times 10$ ⓓ $\beta = \frac{I}{I_0}$
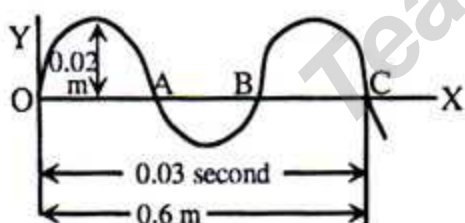
2. ★ If sound intensity is 10^{-2} Wm^{-2} then what would be the sound intensity level?

   ⓐ 10 dB   ⓑ 100 dB
   ⓒ 110 dB   ⓓ 150 dB

3. If a forward wave's initial phase is $\frac{\pi}{2}$ then which one is the displacement-time graph for the wave?

Check the stem below and answer questions 4 and 5:

This is a forward wave.

4. Phase difference between A and B point is-?

   ⓐ 0   ⓑ $\frac{\pi}{2}$

   ⓒ π ⓓ $\frac{3\pi}{2}$

5. A similar but opposite directional wave incidents upon the given wave at x distance the product wave's equation would be —

   ⓐ $Y = 0.04 \cos 5\pi x \sin 100 \pi t$
   ⓑ $Y = 0.04 \cos 5\pi x \sin 200 \pi t$
   ⓒ $Y = 0.04 \cos 5\pi x \sin 300 \pi t$
   ⓓ $Y = 0.04 \cos 5\pi x \sin 400 \pi t$

6. ★ Relation between unit volume mean kinetic energy and pressure of 1 mole ideal gas is —

   ⓐ $P = \frac{2}{3} E$ ⓑ $P = \frac{3}{2} E$

   ⓒ $P = \frac{2}{3} E^2$ ⓓ $P = \frac{1}{3} E$

7. Average kinetic energy of one molecule gas is-?

   ⓐ $\frac{1}{2} KT$ ⓑ $\frac{3}{2} KT$

   ⓒ $\frac{2}{3} KT$ ⓓ 3 KT
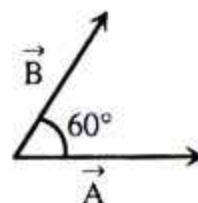
8. Kinetic energy of 2 mole ideal gas in S.T.P is-? [R = 8.31 J mole^{-1} K^{-1}]

   ⓐ 1300 J   ⓑ 2700 J
   ⓒ 3403 J   ⓓ 680 J

9. ★ Which one is S.I unit of length?
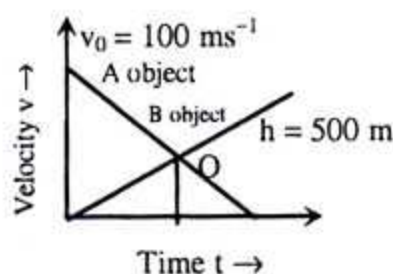
   ⓐ Centimetre
   ⓑ Mile
   ⓒ Meter
   ⓓ Foot

10.

Value of $\vec{A}$ and $\vec{B}$ both vector is 5 unit. Their intermediary angle is 60°. Determine $|\vec{A} - \vec{B}|$.

   ⓐ 0   ⓑ 5 unit
   ⓒ 7.07 unit   ⓓ 8.66 unit

11. An object is thrown upward at v_0 initial velocity. Which of the following describes its height?

   ⓐ $H = \frac{v_0}{g}$ ⓑ $H = \frac{v_0}{2g}$

   ⓒ $H = \frac{v_0^2}{2g}$ ⓓ $H = \frac{v_0^2}{g}$

Check the stem below and answer questions 12 and 13:

A and B are two objects of equal mass. A is thrown upwards and B is released from up along the same throwing line. Their velocity-time graph crosses at the point O. (g = 10ms^{-2})

12. If B falls independently then just at the moment of falling on ground its velocity will be-?
    ⓐ 7 ms^{-1} ⓑ 10 ms^{-1}
    ⓒ 71 ms^{-1} ⓓ 100 ms^{-1}

13. Which one is correct?
    ⓐ Objects will meet at point O
    ⓑ Kinetic energy of both objects is equal at point O
    ⓒ Potential energy of both objects is equal at point O
    ⓓ Object will meet at a time indicated after O

14. Relation between object's kinetic energy and momentum —
    ⓐ $K = \dfrac{m}{p}$ ⓑ $K = \dfrac{2m}{p^2}$
    ⓒ $K = \dfrac{p^2}{2m}$ ⓓ $K = \dfrac{p}{m}$

15. The work done by a force acting on an object is equal to the change of which quantity?
    ⓐ Kinetic energy
    ⓑ Temperature
    ⓒ Density
    ⓓ Potential energy

Check the stem below and answer questions 16 and 17:
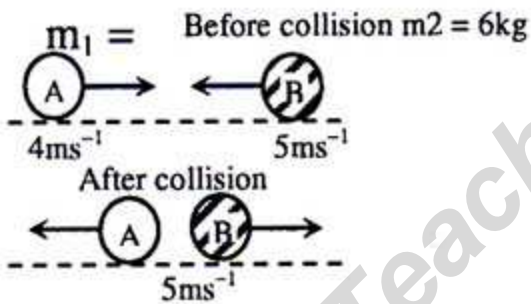
A and B are moving from opposite direction and collides. After the collision they started moving at the opposite direction of their initial movement.

16. What is the velocity of object B after collision?
    ⓐ 2.50 ms^{-1} ⓑ 4.17 ms^{-1}
    ⓒ 5.83 ms^{-1} ⓓ 12.50 ms^{-1}

17. In case of the collision above —
    i. Momentum will be conserved
    ii. Kinetic energy will be conserved
    iii. Collision will be non-elastic
    Which one is correct?
    ⓐ i and ii   ⓑ i and iii
    ⓒ ii and iii   ⓓ i, ii and iii

18. Which one is dimension of energy?
    ⓐ MLT^{-2} ⓑ ML^2T^{-2}
    ⓒ $ML^{-1}T^{-1}$ ⓓ MLT^{-1}

19. A spring is expanded—
    i. It gains potential energy
    ii. It gains restoring force
    iii. Its potential energy is the work done by restoring force
    Which of the following is correct?
    ⓐ i and ii   ⓑ i and iii
    ⓒ ii and iii   ⓓ i, ii and iii

20. ★ Velocity of an artificial satellite which is orbiting earth from h height –
    ⓐ $v = \dfrac{GM}{R+h}$ ⓑ $v = \dfrac{GM}{(R+h)^2}$
    ⓒ $v = \dfrac{GM^2}{R+h}$ ⓓ $v = \sqrt{\dfrac{GM}{R+h}}$

21. At surface of Mars, g = 3.8 ms^{-2} and its radius is 3 × 10^3 km. Escape velocity at the surface of Mars is-?
    ⓐ 4.0 kms^{-1} ⓑ 4.8 kms^{-1}
    ⓒ 7.8 kms^{-1} ⓓ 11.0 kms^{-1}

22. In case of Gravitational voltage —
    i. $V = -\dfrac{GM}{r}$
    ii. Its unit is Jkg^{-1}
    iii. It is a vector quantity
    Which one is correct?
    ⓐ i and ii   ⓑ i and iii
    ⓒ ii and iii   ⓓ i, ii and iii

23. ★ Which one is Young's modulus?
    ⓐ $Y = \dfrac{\text{Length stress}}{\text{Length strain}}$
    ⓑ $Y = \dfrac{\text{Volume stress}}{\text{Volume strain}}$
    ⓒ $Y = \dfrac{\text{Shear stress}}{\text{Shear strain}}$
    ⓓ $Y = \dfrac{\text{Shear stress}}{\text{Length strain}}$

24. m is an object's mass. It is moving in a simple harmonic motion. Its time period will be —
    ⓐ $T = \dfrac{1}{2\pi}\sqrt{\dfrac{m}{K}}$ ⓑ $T = 2\pi^2\sqrt{\dfrac{m}{K^2}}$
    ⓒ $T = 2\pi\sqrt{\dfrac{m}{K}}$ ⓓ $T = \dfrac{1}{2\pi}\dfrac{m}{k^2}$

25. In simple harmonic motion —
    i. Acceleration is proportional to displacement.
    ii. Acceleration is always towards a certain point.
    iii. The force working always obeys reverse square rule.
    Which one is correct?
    ⓐ i and ii   ⓑ i and iii
    ⓒ ii and iii   ⓓ i, ii and 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	ⓐ		