Barishal Board-2017

Sub: Physics 1st paper (Creative)

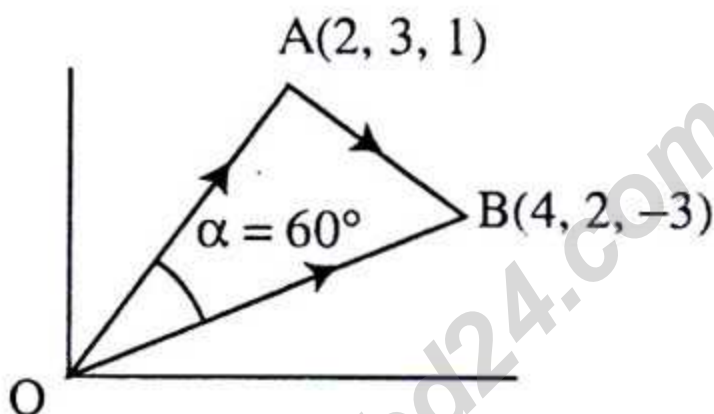Time — 2 hours 35 minutes

Full marks: 50

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

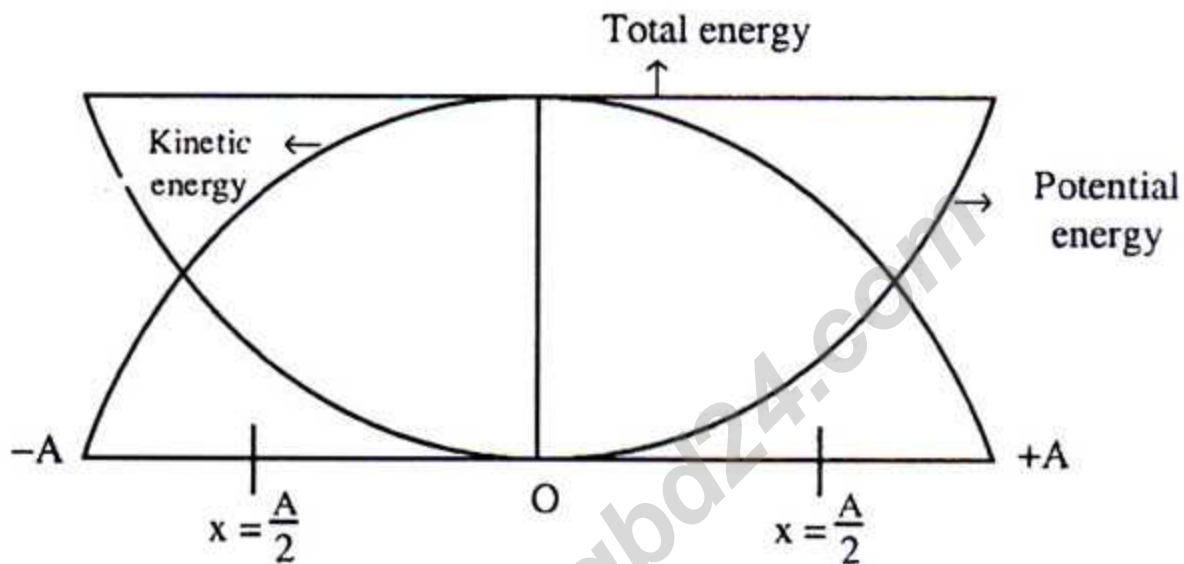1. ★ Coordinates of two points A and B are given below:

   a. Define null vector.   1
   b. Explain why a heavy object is pulled at a lesser angle. 2
   c. Determine the connecting vector of AB.   3
   d. Will the triangle mentioned in stem make a right angle triangle? Analyse and give your opinion.   4

2. ▶ A 60kg dancer can rotate 20 times a minute while spreading her hands. She was trying to find her rhythm with a music.
   a. What is radius of gyration?   1
   b. If the momentum of inertia for a person who is rotating around own axis is half then angular motion is doubled. – Write down its significance.   2
   c. If the dancer needs to rotate 30 minutes to find the rhythm with music, then compare between the momentums of inertia.   3

d. Will the changed angular kinetic energy for the dancer be double? Analyse and give opinion.   4

3. ⭐ In the diagram, an object of 1kg mass is seen to have simple harmonic motion and the energy vs displacement graph is shown below. Amplitude is 0.01m and frequency is 12Hz.

a. What is second pendulum?   1
b. Not all motion of pendulum is simple harmonic. Explain.   2
c. At $x = \dfrac{A}{2}$ position, determine the velocity.   3
d. For $x = \dfrac{A}{2}$ and $x = A$ positions, determine if the law of conservation of mechanical energy will be maintained. 4

4. ▶ To create a transverse wave in a 16m long wire, periodic force is applied and the forward wave's equation would be $y = 2\sin\pi\left(30t - \dfrac{x}{4}\right)$. All quantities are expressed in SI system.

a. What is tune? 1

b. The work done by an object rotating in a circular path is zero. Explain. 2

c. Determine the frequency that is created in the wire. 3

d. For the mentioned wire, due to the movement would the loop created there be of even number? Give your opinions with mathematical analysis. 4

5. ▶ A gramophone record can do 10 rotations per minute. Radius of two tracks on it are of 6cm and 8cm respectively.

a. Define Inertial frame of reference. 1

b. "Even if average velocity is zero average speed is never zero" – Explain this. 2

c. Determine the linear speed of the tracks. 3

d. If the gramophone rotates at 10% increased angular speed then will the sound intensity change? Analyse. 4

6. ▶ Some students at physics lab observed that as air bubble comes from the bottom of pure water, volume becomes 1.1 times. In one step of the experiment, as a student mixed another liquid density of water doubled. (Atmospheric pressure is $10^5 Nm^{-2}$.)

a. What is dew point? 1

b. Saturated atmospheric pressure is highest at one place. Explain. 2

c. If the water temperature is constant, then what is the container's height? 3

d. After mixing the liquid will there be any change in the bubbles' volume? Give opinions with mathematical analysis. 4

7. ⭐ A steel plate is of $1m^2$ area and its thickness is 8mm. Its lower part is attached firmly and by applying force on the upper part rigidity was created. Modulus of rigidity for steel is $8\times10^{10}Nm^{-2}$.

a. What is marginal velocity?   1
b. Though in terms of number surface tension is equal to surface energy they are not same. Explain.   2
c. If rigidity strain is 0.3 then how much force should be applied?   3
d. If the plate is placed on a 2mm thick liquid of 8.5Nsm−2 viscosity coefficient and 500ms−1 kinetic energy is created, would the required force be same? Give your opinion.   4

8. ▶ Earth moves around its own axis once in every 24 hours, it is known as diurnal motion. Due to this rotational motion, gravitational acceleration on earth is not equal everywhere. Radius of earth is 6400 km and gravitational acceleration on surface is $9.8ms^{-2}$.

a. What is escape velocity?   1
b. Why gravitational constant is a scalar quantity?   2
c. Determine gravitational acceleration at earth's 45° latitude.   3
d. For an object's gravitational acceleration be zero at equinoctial region, how should earth's angular motion change? Analyse.   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. ★ **Unit of impulse of force similar to which one?**
   ⓐ Force   ⓑ Momentum
   ⓒ Work   ⓓ Torque

2. **An object of 100gm at a 30° inclined angle on a 5m road will have kinetic energy of –**
   ⓐ 0.49j   ⓑ 0.848j
   ⓒ 1.225j   ⓓ 2.45j

3. **Which is not the characteristic of non-conservative force?**
   ⓐ Work done is zero
   ⓑ Does not depend on path
   ⓒ Law of conservation of mechanical energy is not applicable.
   ⓓ Possible to recover the work that has been done

4. ★ **What is the name of Kepler's third law?**
   ⓐ Law of orbit ⓑ Law of area
   ⓒ Law of time period
   ⓓ Harmonic law

5. **An object will become an artificial satellite if it is thrown at how many times speed of escape velocity?**
   ⓐ $\frac{1}{\sqrt{2}}$ Ve   ⓑ $\frac{1}{2}$ Ve
   ⓒ $\sqrt{2}$ Ve   ⓓ 2 Ve

6. **Which one is the dimension of viscosity coefficient?**
   ⓐ $[ML^{-1}T^{-1}]$ ⓑ $[ML^{-1}T^{-2}]$
   ⓒ $[ML^2T^{-2}]$ ⓓ $[ML^2T^{-3}]$

7. **Which one is not a characteristic of simple harmonic motion?**
   ⓐ Displacement of particle is function of sine or cosine.
   ⓑ Direction of force towards equilibrium.
   ⓒ Kinetic energy is least at equilibrium.
   ⓓ Value of acceleration is opposite of displacement.

8. **100gm object fell into water and so the buoyancy is 0.981N. Viscosity force is —**
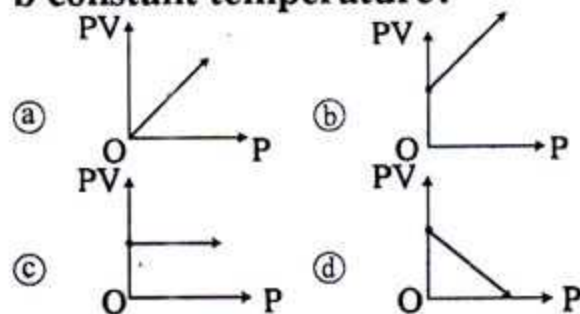   ⓐ 9.81N   ⓑ 0.981N
   ⓒ 0N   ⓓ 1.962N

9. **Kinetic energy of a molecule of 12 independent dimension would be —**
   ⓐ $\frac{1}{2}$ KT   ⓑ $\frac{3}{2}$ KT
   ⓒ 6 KT   ⓓ 12 KT

10. **Which of the following would be a triad?**
    ⓐ 120 : 240 : 360
    ⓑ 80 : 100 : 120
    ⓒ 100 : 150 : 125
    ⓓ 180 : 240 : 300

11. **Which one is PV versus P graph at b constant temperature?**

Read the stem and answer questions 12 and 13:

Length of a simple pendulum's thread is 79.2cm and radius of bob is 0.8cm. (Gravitational acceleration is 9.8ms^{-2}.)

12. ★ **Time period of the pendulum is?**
    ⓐ 0.5077 s   ⓑ 0.5129 s
    ⓒ 0.8976 s   ⓓ 1.7952 s

13. ⭐ **If the pendulum is converted into second pendulum–**
    i. It will be faster
    ii. Time period will be 2 sec
    iii. Thread length should be increased 19.29cm
    Which of the following is correct?
    ⓐ i and ii   ⓑ i and iii
    ⓒ ii and iii   ⓓ i, ii and iii

14. **Surface tension of liquid depends on —**
    i. Radius of capillary tube
    ii. Cohesion force
    iii. Density of liquid
    Which of the following is correct?
    ⓐ i and ii   ⓑ i and iii
    ⓒ ii and iii   ⓓ i, ii and iii

15. **Which does not happen in case of sound wave?**
    ⓐ Reflection   ⓑ Refraction
    ⓒ Interference   ⓓ Polarization

16. **If a wave with 200 complete vibration, in 0.25sec crosses 8m distance, wavelength would be –**
    ⓐ 8cm   ⓑ 4 cm
    ⓒ 32 cm   ⓓ 25 cm

17. **If intensity level is changed 1 dB then the change of sound intensity will be?**
    ⓐ 10%   ⓑ 26%
    ⓒ 50%   ⓓ 100%

18. **Strong nuclear force is generated due to exchange of which particle?**
    ⓐ Graviton   ⓑ Boson
    ⓒ Photon   ⓓ Meson

19. **Real value of a sphere's radius is 3cm and measurable radius is 2.98 cm. What is the percentile error measuring its volume?**
    ⓐ 0.02%   ⓑ 0.066%
    ⓒ 0.66%   ⓓ 2%

20. $\vec{A} = (px + y)\hat{i} + (y - 2z)\hat{j} + (x + 3z)\hat{k}$ **vector will be solenoidal if p =**
    ⓐ 2   ⓑ 4
    ⓒ 3   ⓓ –4

21. $(\hat{i} \times \hat{k}) \times (\hat{j} \times \hat{k}) =$
    ⓐ $\hat{0}$ ⓑ $\hat{i}$
    ⓒ $\hat{j}$ ⓓ $\hat{k}$~

22. ⭐ **A vector with only one foot point is known as?**
    ⓐ Co-planer vector
    ⓑ Co-linear vector
    ⓒ Co-starting vector
    ⓓ Restricted vector

23. **If two equal forces' resultant is half of any one of them what is the intermediary angle between them?**
    ⓐ 28.90°   ⓑ 41.40°
    ⓒ 138.6°   ⓓ 151.04°

24. **A rifle can shoot at 300ms⁻¹ velocity and 40° and 50° angle. For the two bullets —**
    i. Perambulation period will be different.
    ii. Range will be equal.
    iii. Horizontal component of their own velocity will not change.
    Which one is correct?
    ⓐ i and ii   ⓑ i and iii
    ⓒ ii and iii   ⓓ i, ii and iii

25. **An object's velocity is $v(t) = (6t^2 + 2t)$ ms⁻¹. Its displacement after 2 sec is-?**
    ⓐ 20m   ⓑ 26m
    ⓒ 28m   ⓓ 56m

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	ⓐ		