WEEKLY TEST TYJ-02 TEST 20 RAJPUR ROAD
SOLUTION Date 29-12-2019

[PHYSICS]

1. (a) $v = n\lambda = 2\times5 = 10\ cm/sec$

2. (a) $v_{max} = a\omega = a\times2\pi n = 0.1\times2\pi\times300 = 60\pi\ cm/sec$

3. (c) Phase difference $= \frac{2\pi}{\lambda}\times$ path difference

$\Rightarrow 1.6\pi = \frac{2\pi}{\lambda}\times40 \Rightarrow \lambda = 50\ cm = 0.5m$

$\Rightarrow v = n\lambda \Rightarrow 330 = 0.5\times n \Rightarrow n = 660\ Hz$

4. (a)

5. (a) $\lambda = \frac{v}{n} = \frac{1.7\times1000}{4.2\times10^6} = 4\times10^{-4}\ m$

6. (c) Velocity of sound in gas $v = \sqrt{\frac{\gamma RT}{M}} \Rightarrow v \propto \sqrt{\frac{\gamma T}{M}}$

$\Rightarrow \frac{v_{N_2}}{v_{He}} = \sqrt{\frac{\gamma_{N_2}}{\gamma_{He}}\times\frac{M_{He}}{M_{H_2}}} = \sqrt{\frac{\frac{7}{5}R\times4}{\frac{5}{3}R\times28}} = \frac{\sqrt{3}}{5}$

7. (a) Time required for a point to move from maximum displacement to zero displacement is $t = \frac{T}{4} = \frac{1}{4n}$

$\Rightarrow n = \frac{1}{4t} = \frac{1}{4\times0.170} = 1.47\ Hz$

8. (c) $\lambda = \frac{v}{n} = \frac{340}{200} = 1.7\ m$

9. (a) The time taken by the stone to reach the lake

$t_1 = \sqrt{\left(\frac{2h}{g}\right)} = \sqrt{\left(\frac{2\times500}{10}\right)} = 10sec$ (Using $h = ut + \frac{1}{2}gt^2$)

Now time taken by sound from lake to the man

$t_2 = \frac{h}{v} = \frac{500}{340} \approx 1.5\sec$

$\Rightarrow$ Total time $= t_1 + t_2 = 10 + 1.5 = 11.5\sec.$

10. (b) Distance between a compression and the nearest rarefaction is $\frac{\lambda}{2} = 1m.$ Hence

$n = \frac{v}{\lambda} = \frac{360}{2} = 180\ Hz.$

11. (a) $v = \sqrt{\frac{\gamma P}{\rho}} \Rightarrow \frac{v_{O_2}}{v_{H_2}} = \sqrt{\frac{\rho_{H_2}}{\rho_{o_2}}} = \sqrt{\frac{1}{16}} = \frac{1}{4}$

12. (d) Speed of sound in gases is $v = \sqrt{\frac{\gamma RT}{M}} \Rightarrow T \propto M$

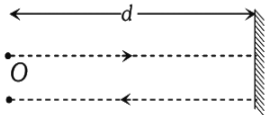
(Because v, γ-constant). Hence $\frac{T_{H_2}}{T_{O_2}} = \frac{M_{H_2}}{M_{O_2}}$

$\Rightarrow \frac{T_{H_2}}{(273+100)} = \frac{2}{32} \Rightarrow T_{H_2} = 23.2K = -249.7°C$

13. (c) Path difference $\Delta = \frac{\lambda}{2\pi}\times\phi \Rightarrow 1 = \frac{\lambda}{2\pi}\times\frac{\pi}{2} \Rightarrow \lambda = 4m$

Hence $v = n\lambda = 120\times4 = 480\ m/s$

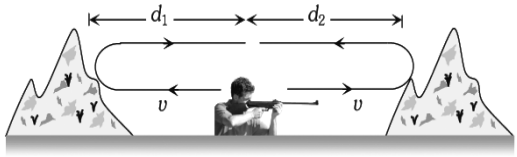
14. (a) Suppose the distance between shooter and reflecting surface is d. Hence time interval for hearing echo is



$t = \frac{2d}{v} \Rightarrow 8 = \frac{2d}{350} \Rightarrow d = 1400\ m.$

15. (d) $v = \sqrt{\frac{\gamma P}{\rho}}$; as P changes, ρ also changes. Hence $\frac{P}{\rho}$ remains constant so speed remains constant.

16. (b)



$2d_1 + 2d_2 = v\times t_1 + v\times t_2 \Rightarrow 2(d_1 + d_2) = v(t_1 + t_2)$

$d_1 + d_2 = \frac{v(t_1 + t_2)}{2} = \frac{340\times(1.5+3.5)}{2} = 850\ m.$

17. (b) By using $v = \sqrt{\frac{\gamma RT}{M}} \Rightarrow v \propto \sqrt{T}$

$\frac{v_2}{v_1} = \sqrt{\frac{T_2}{T_1}} = \sqrt{\frac{T+600}{T}} = \sqrt{3} \Rightarrow T = 300K = 27°C$

18. (c) $v = \sqrt{\frac{\gamma RT}{M}} \Rightarrow v \propto \sqrt{T}$

i.e. if v is doubled then T becomes four times,

hence $T_2 = 4T_1 = 4(273+27) = 1200K = 927°C$

19. (c) Since solid has both the properties (rigidity and elasticity)

20. (b) Frequency of wave is $n = \frac{3600}{2\times 60} Hz \Rightarrow$

$\lambda = \frac{v}{n} = \frac{760}{30} = 25.3\ m.$

[CHEMISTRY]

21. (c) $C_{12}H_{22}O_{11}$ is a sugar and non-electrolyte.

22. (b) It is a weak electrolyte since it is slightly ionized.

23. (b) Electrolytes are those substances which on dissolving in water give ions.

24. (a) $K = \frac{\alpha^2 C}{1-\alpha}; \alpha = \frac{0.01}{100} \approx 1 \ \therefore K = \alpha^2 C = \left[\frac{0.01}{100}\right]^2 \times 1$

$= 1\times 10^{-8}$.

25. (a) $NaCl$, being a salt, is a strong electrolyte.

26. (c) According to the Ostwald's dilution formula $\alpha^2 = \frac{K(1-\alpha)}{C}$. But for weak electrolytes α is very small. So that $(1-\alpha)$ can be neglected. So that $\alpha = \sqrt{\frac{K_a}{C}}$.

27. (d) Generally ionic compound are conduct electricity in fused state.

28. (d) According to Ostwald's dilution law because degree of ionization is directly proportional to the dilution.

29. (b) The degree of ionisation of a solute depends upon its nature, concentration, and temperature.

30. (b) Mathematical form of Ostwald's dilution law.

31. (a) CO doesn't have a vacant d-orbital.

32. (d) $\underbrace{HClO_4 + H_2O \rightleftharpoons H_3O^+ + ClO_4^-}_{\text{Conjugate acid and base pair}}$

33. (a) $FeCl_3 + 3H_2O \rightleftharpoons Fe(OH)_3 + 3HCl$. Strong acid and weak base.

34. (c) $Na_2CO_3 + 2H_2O \rightleftharpoons 2NaOH + H_2CO_3$

35. (b) Those substance accept the proton are called Bronsted base and which is donate the proton are called Bronsted acid.

$HCO_3^- + H^+ \rightleftharpoons H_2CO_3$ Bronsted base.

$HCO_3^- \rightleftharpoons H^+ + CO_3^{--}$ Bronsted acid.

37. (b) The value of pK_a for strong acid is less.

38. (c) Because it is a salt of strong base and weak acid.

39. (b) Because it is conjugate base of weak acid.

$CH_3COOH \rightleftharpoons CH_3COO^- + H^+$.

[MATHEMATICS]

1. (d) **Trick :** Obviously the centre of the given circle is $(1,-2)$. Since the sides of square are parallel to the axes, therefore, first three alternates cannot be vertices of square because in first two (a and b) $y=-2$ and in (c) $x=1$, which passes through centre $(1,-2)$ but it is not possible. Hence answer (d) is correct.

2. (d) Here the centre of circle $(3,-1)$ must lie on the line $x+2by+7=0$.

Therefore, $3-2b+7=0 \Rightarrow b=5$.

3. (a) Radius = perpendicular distance from $(1,-3)$ to $3x-4y-5=0$, *i.e.* $\left|\frac{3+12-5}{\sqrt{5^2}}\right|=2$.

4. (a) Required equation is $(x-a)^2+(y-a)^2=a^2$

$\Rightarrow x^2+y^2-2ax-2ay+a^2=0$.

5. (b) Centres are $(0,0)$, $(-3,1)$ and $(6,-2)$ and a line passing through any two points say $(0,0)$ and $(-3,1)$ is $y=-\frac{1}{3}x$ and point $(6,-2)$ lies on it. Hence points are collinear.

6. (c) Let the equation of circle be $x^2+y^2+2gx+2fy+c=0$. Now on passing through the points, we get three equations.

$c=0$ ....(i)

$a^2+2ga+c=0$ ....(ii)

$b^2+2fb+c=0$ ....(iii)

On solving them, we get $g=-\frac{a}{2}, f=-\frac{b}{2}$

Hence the centre is $\left(\frac{a}{2},\frac{b}{2}\right)$.

7. (b) Centre of circle = Point of intersection of diameters = $(1,-1)$

Now area $=154 \Rightarrow \pi r^2=154 \Rightarrow r=7$

Hence the equation of required circle is

8. (b) Two, centre of each lying on the perpendicular bisector of the join of the two points.

9. (c) $2\sqrt{g^2-c}=2a$ ....(i)

$2\sqrt{f^2-c}=2b$ ....(ii)

On squaring (i) and (ii) and then subtracting (ii) from (i), we get $g^2-f^2=a^2-b^2$.

Hence the locus is $x^2-y^2=a^2-b^2$.

10. (c) $(\text{Radius})^2=g^2+f^2-c$ or $121=81+36-k$

or $k=-4$.

11. (c) (x_1,y_1) and (x_2,y_2) are extreme points of diameter. Hence centre is $\left(\frac{x_1+x_2}{2},\frac{y_1+y_2}{2}\right)$.

12. (d) Infinite, as there is a family of co-axial circles.

13. (c) Centre is (2, 3). One end is (3, 4).

P_2 divides the join of P_1 and O in ratio of 2 : 1.

Hence P_2 is $\left(\frac{4-3}{2-1},\frac{6-4}{2-1}\right)\equiv(1,2)$.

14. (a) The point of intersection of $3x+y-14=0$ and $2x+5y-18=0$ are

$x=\frac{-18+70}{15-2}, y=\frac{-28+54}{13} \Rightarrow x=4, y=2$

i.e., point is (4, 2).

Therefore radius is $\sqrt{(9)+(16)}=5$ and equation is $x^2+y^2-2x+4y-20=0$.

Trick : The only circle is $x^2+y^2-2x+4y-20=0$, whose centre is $(1,-2)$.

15. (b) Centre (2, 2) and

$R=\sqrt{(4-2)^2+(5-2)^2}=\sqrt{13}$

16. (c) Extremities of diameter are (5, 7) and (1, 4) and radius is half of the distance between them

$=\frac{1}{2}\sqrt{(4)^2+(3)^2}=\frac{5}{2}$.

17. (b) Centre is $(-4,-5)$ and passes through (2, 3).

18. (c) It is a fundamental concept.

19. (c) Centre (3, 4) is satisfying only $x+y=7$.

20. (c) Conditions are $g=f=r$ and $\sqrt{g^2+f^2-c}=r \Rightarrow g=\sqrt{c}$.