GLOBAL TALENT SEARCH EXAMINATIONS (GTSE)

CLASS -XI

Max Marks: 240

PHYSICS & CHEMISTRY

General Instructions: (*Read Instructions carefully*)

1. All questions are compulsory. First 15 minutes for reading instructions.
2. This paper contains **60 objective type questions**. Each question or incomplete sentence is followed by four suggested answers or completions. Select the one that is the most appropriate in each case and darken the correct alternative on the given answer-column, with a pencil or pen.
3. For each correct answer **4 marks** will be awarded and **1 mark** will be deducted for each incorrect answer.
4. No extra sheet will be provided.
5. Use of calculators & mobile is not permitted in examination hall.
6. Use of unfair means shall invite cancellation of the test

Name of the Student : ______________________________

Roll No. : | | | | | | | | |

Centre : ______________________________

Invigilator's Signature : ______________________________

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PHYSICS

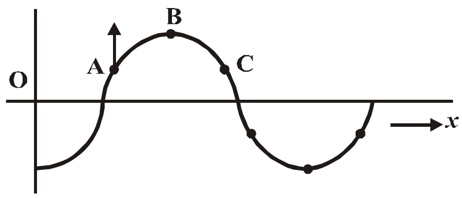
1. Take the effect of bulging of earth and its rotation in account. Consider the following statements

(*i*) There are points outside the earth where the value of g is equal to its value at the equator

(*ii*) There are points outside the earth where the value of g is equal to its value at the poles

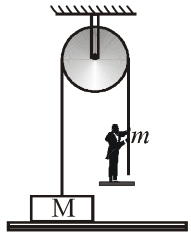
(a) both (*i*) and (*ii*) are correct
(b) (*i*) is correct but (*ii*) is wrong
(c) (*ii*) is correct but (*i*) is wrong
(d) both (*i*) and (*ii*) are wrong.

2. At any instant a wave travelling along the string shown in the figure. Here, point 'A' is moving upward. Which of the following statement is true



(a) The wave is travelling to the right
(b) The displacement amplitude of wave is equal to displacement of B at this instant
(c) At this instant 'C' also directed upward.
(d) none of these

3. Figure shows a block of mass M resting on a horizontal surface. The acceleration with which a boy of mass m should climb the rope (neglect mass) so as to lift the block should be greater than



(a) $\frac{M}{m}g$
(b) $\left(\frac{M}{m}-1\right)g$
(c) $\left(\frac{M}{m}+1\right)g$
(d) $\frac{mg}{M}$

- : Rough Space : -

4. Two identical long, thin, solid cylinders are used to conduct heat from a reservoir at temperature T_{hot} to a reservoir at temperature T_{cold}. Originally the cylinders are connected in series as shown in the figure (a), and the rate of heat transfer is H_0. If the cylinders are connected in parallel instead as shown in the figure (b), then what would be that rate of heat transfer?

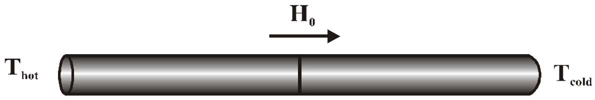


Figure (a)

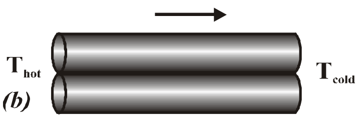


Figure (b)

(a) $16\ H_0$ (b) $4\ H_0$
(c) $2\ H_0$ (d) $H_0/2$

5. A particle of mass M is executing oscillations about the origin on the *x*-axis. Its potential energy is $|U| = kx^2$, where K is a positive constant. If the amplitude of oscillation is *a*, then its period *t* is

(a) proportional to $\frac{1}{\sqrt{a}}$ (b) independent of *a*
(c) proportional to $\sqrt{a}$ (d) proportional to $a^{3/2}$.

6. A rod is made of 20 uniform pieces of length 1 cm each, by revetting them together. It is rotated with an angular velocity ω about an axis perpendicular to its length and passing through its centre. Suddenly, two pieces, one from each end, fall. The angular velocity of the remaining part would change to (Assuming breaking away part will exert readial force only while breaking away)

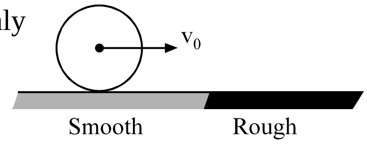
(a) ω again (b) $\frac{100}{81}\omega$ (c) $\frac{10}{9}\omega$ (d) $\frac{1000}{729}\omega$

7. A swimmer crosses a flowing stream of width ω to and fro in time t_1. The time taken to cover the same distance up and down the stream is t_2. If t_3 is the time the swimmer would take to swim a distance 2ω in still water, then

(a) $t_1^2 = t_2\ t_3$ (b) $t_2^2 = t_1\ t_3$ (c) $t_3^2 = t_2\ t_3$ (d) $t_3 = t_1 + t_2$

- : Rough Space : -

8. A sphere moving with a velocity v_0 on a smooth surface suddenly enters on a rough horizontal surface as shown in figure.



Which of the following statement is false ?

(a) The sphere loses translational kinetic energy and gains rotational kinetic energy.

(b) The total energy of the sphere is not conserved

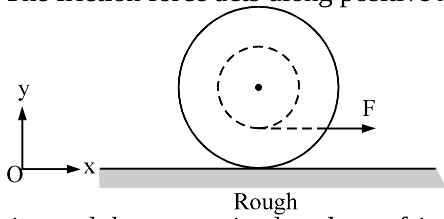
(c) The final velocity attained by the centre of mass is $\frac{2v_0}{3}$

(d) The angular momentum of the sphere about any point on the surface is conserved

9. The following figure shows an arrangement of a spool, being pulled with a constant force F. See the following statements.

[A] The c.m. moves along negative *x*-axis

[B] The friction force acts along positive x-axis



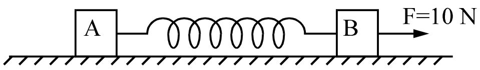
(a) A is correct, B is wrong

(b) A is wrong, B is correct

(c) Both A and B are wrong

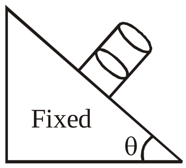
(d) Both A and B are correct

10. Two blocks of equal mass 5 kg are joined by a relaxed spring and the system is placed on a frictionless horizontal surface. A constant force 10 N is applied on one of the blocks pulling it away from the other as shown. Find the position of the centre of mass after 0.5 second.



(a) 1/6 m (b) 1/5 m (c) 1/8 m (d) None of these

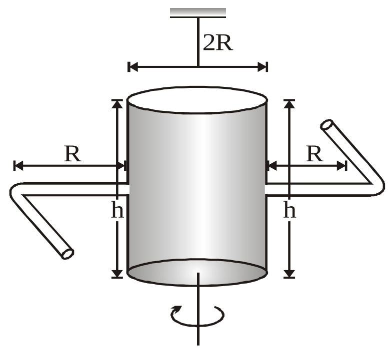
11. A cylindrical vessel filled with water is released on an inclined surface of angle θ as shown in figure. The friction coefficient of surface with vessel is μ(< tanθ). Then the constant angle made by the surface of water with the incline will be



(a) $\tan^{-1}\mu$ (b) $\theta - \tan^{-1}\mu$ (c) $\theta + \tan^{-1}\mu$ (d) $\cot^{-1}\mu$

- : Rough Space : -

12. A cylindrical container of radius 'R' and height 'h' is completely filled with a liquid. Two horizontal L shaped pipes of small cross-section area 'a' are connected to the cylinder as shown in the figure. Now the two pipes are opened and fluid starts coming out of the pipes horizontally in opposite directions. Then the torque due to ejected liquid on the system is



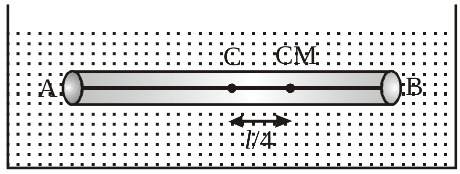
(a) 4 aghρR (b) 8 aghρR

(c) 2 aghρR (d) none of these

13. A non uniform cylinder of mass *m*, length *l* and radius *r* is having its centre of mass at a distance l/4 from the centre and lying on the axis of the cylinder. The cylinder is kept in a liquid of uniform density ρ. The moment of inertia of the rod about the centre of mass is *I*. The acceleration of point A relative to point B just after the rod is released from the position shown in figure is

(a) $\frac{\pi\rho g l^3 r^2}{I}$ (b) $\frac{\pi\rho g l^3 r^2}{4I}$

(c) $\frac{\pi\rho g l^3 r^2}{2I}$ (d) $\frac{3\pi\rho g l^3 r^2}{4I}$

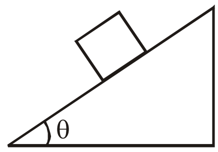


14. An isolated and charged spherical soap bubble has a radius *r* and the pressure inside it atmospheric if *T* is the surface tension of soap solution, then charge on drop is

(a) $\sqrt{\frac{2rT}{\varepsilon_o}}$ (b) $8\pi r\sqrt{2\,rT\varepsilon_o}$ (c) $8\pi r\sqrt{rT\varepsilon_o}$ (d) $8\pi\, r\sqrt{\frac{2rT}{\varepsilon_o}}$

- : Rough Space : -

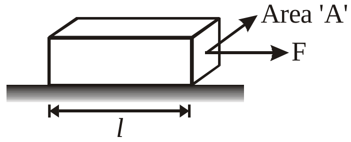
15. A cubical block of side a and density ρ slides over a fixed inclined plane with constant velocity v. There is a thin film of viscous fluid of thickness t between the plane and the block. Then the coefficient of viscosity of the thin film will be



(a) $\eta = \frac{\rho agt \sin\theta}{v}$ (b) $\frac{\rho agt \sin\theta}{v}$

(c) $\frac{v}{\rho agt \sin\theta}$ (d) none of these

16. A block of mass M area of cross-section A and length l is placed on smooth horizontal floor. A force F is applied on the block as shown. If y is young modulus of material, then total extension in the block will be



(a) $\frac{Fl}{Ay}$ (b) $\frac{Fl}{2Ay}$

(c) $\frac{Fl}{3Ay}$ (d) cannot extend

17. P and Q are two small loud speakers which emit sound waves of the same amplitude but with a phase difference of π. A small receiver R moves along the perpendicular bisector of PQ in the direction away from P and Q. The intensity of the sound recorded in the receiver is :

(a) continuously decreasing tending to zero at a very large distance

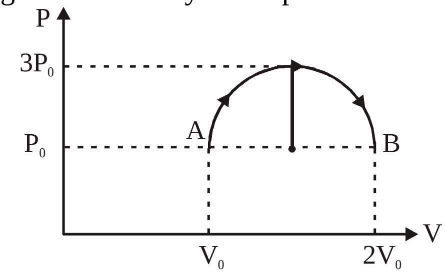
(b) alternates between a constant maximum and zero minimum

(c) alternates between diminishing maximum and increasing minimum

(d) remains constant equal to zero.

- : Rough Space : -

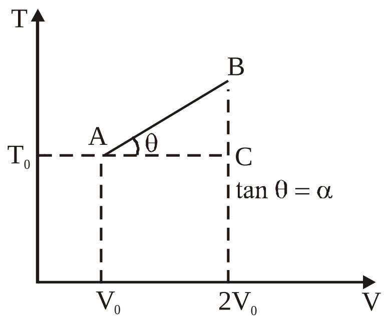
18. One mole of an ideal monoatomic gas is taken through the thermodynamic process shown in the P–V diagram. The heat supplied to the system is



(a) $P_0^2\left(\frac{5+\pi}{2}\right)$ (b) $P_0V_0\left(\frac{2\pi-1}{2}\right)$

(c) $P_0V_0(1+\pi)$ (d) $P_0V_0\left(\frac{5+\pi}{2}\right)$

19. One mole of an ideal monoatomic gas undergoes the process A to B through ACB as shown in the T-V indicator diagram. If volume of the system changes from V_0 to $2V_0$, then find the amount of heat transferred to the system



(a) $\frac{5RV_0}{2}+\frac{RT_0}{\alpha}\ln 2$ (b) $\frac{3RV_0}{2}+\frac{RT_0}{\alpha}\ln 2$

(c) $\frac{5R\alpha V_0}{2}+RT_0\ln 2$ (d) $\frac{3R\alpha V_0}{2}+RT_0\ln 2$

20. Two identical containers A and B have frictionless pistons. They contain the same volume of an ideal gas at the same temperature. The mass of the gas in A is m_A and that in B is m_B. The gas in each cylinder is now allowed to expand isothermally to double the initial volume. The changes in the pressure in A and B are found to be Δp and $1.5\,\Delta p$ respectively.

(a) $4m_A = 9m_B$ (b) $2m_A = 3m_B$ (c) $3m_A = 2m_B$ (d) $9m_A = 4m_B$

21. Four simple harmonic vibrations

$y_1 = 8\cos\omega t$, $y_2 = 4\cos(\omega t + \pi/2)$

$y_3 = 4\cos(\omega t + \pi)$, $y_4 = \cos(\omega t + 3\pi/2)$

are superimposed on each other, the resulting amplitude and phase are respectively.

(a) 5 and $\tan^{-1}(1/2)$ (b) 5 and $\tan^{-1}(1/3)$ (c) 5 and $\tan^{-1}(3/4)$ (d) 5 and $\tan^{-1}(4/3)$

- : Rough Space : -

22. Two vibrating tuning forks producing progressive waves given by

$y_1 = 4 \sin (500\, \pi t) \quad y_2 = 2 \sin (506\, \pi t)$

are held near the ear of a person. the person will hear

(a) 3 beats with intensity ratio between maxima and minima equal to 2

(b) 3 beats with intensity ratio between maxima and minima equal to 9

(c) 6 beats with intensity ratio between maxima and minima equal to 2

(d) 6 beats with intensity ratio between maxima and minima equal to 9

23. A metal string is fixed between rigid supports. It is initially at negligible tension. Its young's modules is Y. Density is ρ and co-efficient of thermal expansion is α. If it is now cooled through a temperature = t, transverse waves will move along it with speed

(a) $Y\sqrt{\alpha t/\rho}$ (b) $\alpha t\sqrt{y/\rho}$ (c) $\sqrt{y\alpha t/\rho}$ (d) $t\sqrt{y\alpha/\rho}$

24. Two ends of a stretched wire of length L are fixed at x = 0 and x = L. In one experiment the displacement of the wire is $y_1 = A \sin (\pi x/L) \sin\omega t$ and energy E_1 and in another experiment its displacement is $y_2 = A \sin (2\pi x/L) \sin 2\omega t$ and energy is E_2 then

(a) $E_2 = E_1$ (b) $E_2 = 2E_1$ (c) $E_2 = 4E_1$ (d) $E_2 = 16E_1$

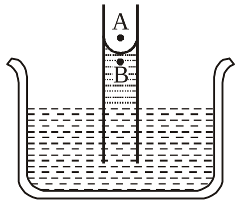
25. Two sources producing sound waves of same frequency are kept stationary at a separation of 1.0 mm. An observer moving along a line parallel to the line joining the sources and at a distance of 10 m finds that the distance between two consecutive maxima is 3.3 mm. If the velocity of sound is 330 m/s, then the frequency of the source is

(a) 1kHz (b) 3 kHz (c) 3.5 kHz (d) none of these

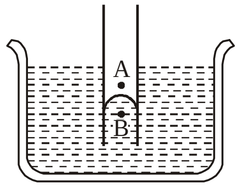
- : Rough Space : -

26. Capillary rise and shape of droplets on a plate due to surface tension are shown in the column II Match the following

A. Adhesive forces is greater than cohesive force

(p) 

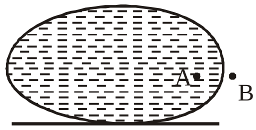
B. Cohesive forces is greater than adhesive forces.

(q) 

C. Pressure at A > pressure at B

(r) A mercury drop is pressed between two parallel glass plates.

D. Pressure at B > Pressure at A

(s) 

(a) A-(p); B-(p), (q), (r); C-(r), (s); D-(p), (r)

(b) A-(p); B-(q), (r), (s); C-(p), (s); D-(q), (r)

(c) A-(q); B-(p), (s); C-(p), (r), (s); D-(q), (s)

(d) A-(q); B-(p), (r), (s); C-(q), (s); D-(r), (s)

- : Rough Space : -

27. Consider a situation (p) that two sound waves, $y_1 = (0.2\text{ m}) \sin 504\pi(t - x/300)$ and $y_2 = (0.6\text{ m}) \sin 496\pi(t - x/300)$ are superimposed. Consider another situation (q) that two sound waves, $y_1 = (0.4\text{ m}) \sin 504\pi(t - x/300)$ and $y_2 = (0.4\text{ m}) \sin 504\pi(t + x/300)$, are superimposed. Match Column-I with Column-II

Column-I	Column-II
A. In situation (p)	(p) Stationary waves are formed
B. In situation (q)	(q) There will be the phenomenon of 'Beats'
C. When two waves of same frequency and amplitude and travelling in opposite directions superimpose	(r) Amplitude of the resultant wave will vary periodically with position
D. If the intensity of sound alternately increases and decreases periodically as a result of superposition of waves of slightly different frequencies	(s) Amplitude of the resultant wave will vary periodically with time

(a) A-(q), (s); B-(p), (r); C-(p), (r); D-(q), (s)
(b) A-(p), (r); B-(q), (s); C-(q), (r); D-(q)
(c) A-(q), (r); B-(p), (s); C-(r), (s); D-(p), (r)
(d) A-(r), (s); B-(p), (q); C-(p), (s); D-(p)

Comprehension

A conductor of length $l = 1$ m, radius $r = 1$ cm, resistivity $\rho = 2.5 \times 10^{-8}\ \Omega$m (independent of temperature) is connected to a cell of constant emf $e = 5$V as shown in the figure. Initially the conductor is at room temperature $T_0 = 300$ K. At $t = 0$, the switch S_W is closed. the conductor starts radiating heat to the environment, according to Newton's law of cooling and the constant of cooling is $K = 10\text{ sec}^{-1}$. Heat capacity of the conductor is π J/k. Answer the following question (Resistance of connecting wire is negligible and assume room temperature does not change appreciably due to radiations from the conductor)

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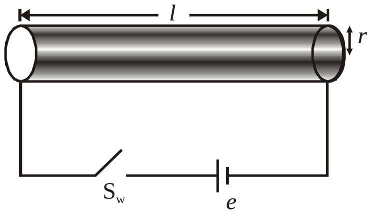


28. What is the steady state temperature of the conductor?

(a) 300 K (b) 10,000 K

(c) 9700 K (d) 10,300 K

29. Find the temperature of the conductor as a function of time

(a) $300 + 10^4 (1 - e^{-10t})$ (b) $10^4(1 - e^{-10t}) - 300$

(c) $(10^4 + 300)(1 - e^{-10t})$ (d) constant at 300 K

30. Find the rate of heat radiation through the conductor, when its temperature has becomes constant

(a) $\pi \times 10^5$ J/sec (b) 10^5 J/sec

(c) $10\,\pi \times (10^4 - 300)$ J/sec (d) can't be calculated

CHEMISTRY

31. Equal volume of two solutions having pH = 2 and pH = 10 are mixed together at 90°C. Then pH of resulting solution is : (Take k_ω at 90°C = 10^{-12})

(a) 2 + log 2 (b) 10 – log 2 (c) 7 (d) 6

32. A certain acid-base indicator is red in acid solution and blue in basic solution. 75% of the indicator is present in the solution in its blue form at pH = 5. Calculate the pH at which the indicator shows 90% red form

(a) 3.56 (b) 5.47 (c) 2.5 (d) 7.4

33. Equilibrium constant of the reaction of NH_4OH with strong acid is 10^9. Initially a solution of 0.05 M $(NH_4)SO_4$ and 0.1 M NH_4NO_3 is prepared. If 0.1 M NaOH is added in equal volume, then pH change of solution nearly will be

(a) 3.15 (b) 4.85 (c) 4.15 (d) 3.85

- : Rough Space : -

34. The number of moles of ferrous oxalate oxidised by one mole of $KMnO_4$ is

(a) $\frac{5}{2}$ (b) $\frac{2}{5}$ (c) $\frac{3}{5}$ (d) $\frac{5}{3}$

35. 100 ml 30% (w/v) NaOH solution is mixed with 100 ml 90% (w/v) NaOH solution. Find the molarity of final solution

(a) 1.3 (b) 13 (c) 1.5 (d) 15

36. A mixed solution of potassium hydroxide and sodium carbonate required 15 ml of N/20 HCl solution when titrated with phenolphthalein as an indicator. But the same amount of the solution when titrated with methyl orange as an indicator required 25 ml of the same acid. The amount of KOH present in the solution is

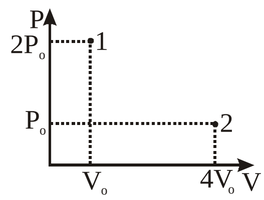
(a) 0.014 g (b) 0.14 g (c) 0.028 g (d) 1.4 g

37. One mole of an ideal monoatomic gas expands isothermally against constant external pressure of 1 atm from initial volume of 1L to a state where its final pressure becomes equal to external pressure. If initial temperature of gas is 300 K then total entropy change of system in the above process is

[R = 0.082 L atm mol^{-1} K^{-1} = 8.3 J mol^{-1} K^{-1}]

(a) 0 (b) Rln (24.6) (c) Rln (2490) (d) $\frac{3}{2}$ Rln (24.6)

38. A liquid which is confined inside an adiabatic piston is suddenly taken from state 1 to state 2 by a single state process. If the piston comes to rest at point 2 as shown. Then the enthalpy change for the process will be



(a) $\Delta H = \frac{2\gamma P_o V_o}{\gamma - 1}$ (b) $\Delta H = \frac{3\gamma P_o V_o}{\gamma - 1}$

(c) $\Delta H = - P_o V_o$ (d) none of these

- : Rough Space : -

39. A 10L container at 300 K contains CO_2 gas at pressure of 0.2 atm and an excess solid CaO (neglect the volume of solid CaO). The volume of container is now decreased by moving the movable piston fitted in the container. What will be the maximum volume of container when pressure of CO_2 attains its maximum value given that

$CaCO_3(s) \rightleftharpoons CaO(s) + CO_2(g)$ Kp = 0.800 atm

(a) 5 L (b) 2.5 L

(c) 1 L (d) The information is insufficient

40. At constant pressure, the addition of argon

(a) reduces the formation of ammonia from nitrogen and hydrogen

(b) increases the formation of ammonia from nitrogen and hydrogen

(c) does not affect the equilibrium of the reaction in which ammonia is formed from nitrogen and hydrogen

(d) reduces the dissociation of ammonia

41. Which of the following is incorrect statement?

(a) The first ionisation potential of Al is less than the first ionisation potential of Mg

(b) Radius of hydrated Li^+ is more than that of hydrated Cs^+

(c) The formation of S^{2-} is an endothermic process

(d) None of these

42. The correct order of second ionisation potential of carbon, nitrogen, oxygen and fluorine is

(a) C > N > O > F (b) O > N > F > C (c) O > F > N > C (d) F > O > N > C

43. According to Molecular orbital theory which of the following is correct

(a) LUMO level for C_2 molecule is σ_{2p_x} orbital (b) In C_2 molecules both the bonds are π bonds

(c) In C_2^{2-} ion there is one σ and two π bonds (d) All the above are correct

- : Rough Space : -

44. There is no S – S bond in

(a) $S_2O_3^{2-}$ (b) $S_2O_4^{2-}$ (c) $S_4S_6^{2-}$ (d) $S_2O_7^{2-}$

45. Which of the following have identical bond order

(I) CN^- (II) O_2^- (III) NO^+ (IV) CN^+

(a) I, III (b) I, II (c) II, III (d) I, II, III

46. For which orbital angular probability distribution is maximum at an angle of 45° to the axial direction

(a) $d_{x^2-y^2}$ (b) d_{z^2} (c) d_{xy} (d) P_x

47. Probability of finding the electron Ψ^2 of 's' orbital doesn't depend upon

(a) Distance from nucleus (r) (b) Energy of 's' orbital

(c) Principal quantum number (d) Azimuthal quantum number

48. Two glass bulb A and B are connected by a very small tube (of negligible volume) having stop cock bulb A has a volume of 100 cm^3 and contains certain gas while bulb B is empty. On opening the stop cock, the pressure in 'A' fell down by 60%. The volume of bulb B must be

(a) 200 mL (b) 150 mL (c) 250 mL (d) 100 mL

49. A certain gas effuses out of two different vessels A and B. A has a circular orifice while B has a square orifice or length equal to the radius of the orifice of vessel A. The ratio of rate of diffusion of the gas from vessel A to the from vessel B is

(a) $\pi : 1$ (b) $1 : \pi$ (c) 1 : 1 (d) 3 : 2

50. If NaOH is added to an aqueous solution of Zn^{2+} ions, a white precipitate appears and on adding excess of NaOH, the precipitate dissolves. In the solution, zinc exists in the

(a) Anionic part (b) Cationic part

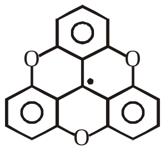
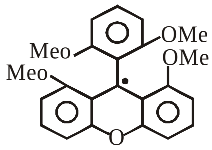
(c) Both in anionic and cationic part (d) Colloidal form

- : Rough Space : -

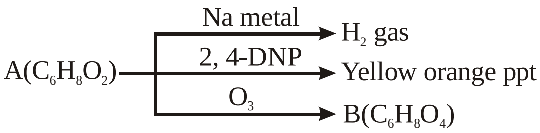
51. A metal [X] on heating in nitrogen gas gives [Y]. [Y] on treatment with H_2O gives a colourless gas which when passed through $CuSO_4$ solution gives a blue colour. [Y] is

(a) $Mg(NO_3)_2$ (b) Mg_3N_2 (c) NaN_3 (d) MgO

52. Which is most stable?

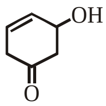
(a)  (b)  (c) $Ph-\overset{O}{\overset{\|}{C}}-CH_2-\dot{C}H_2$ (d) $CH_2=CH\bullet$

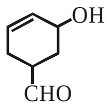
53. The compound A gives following reactions,



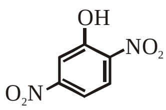
. Its structure can be

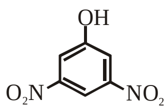
(a) $CH_2=CH-(CH_2)_2-\underset{\underset{O}{\|}}{C}-CH_2OH$ (b) $OHC-(H_2C)_2-HC=HC-COOH$

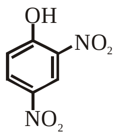
(c) 

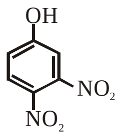
(d) 

54. The most acidic among the given compounds is

(a) 

(b) 

(c) 

(d) 

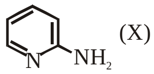
55. 10 ml 0.1 M $Na_2S_2O_3$ is required to titrate evolved iodine for the detection of % enol of

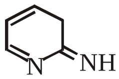
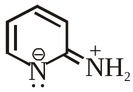
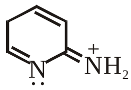
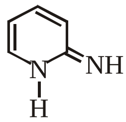
$-CH_2COCH_2CHO-$. The mass of enol is

(a) 0.25 (b) 0.162 (c) 0.17 (d) 0.3

- : Rough Space : -

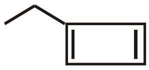
56. The proper tautomeric structure for 2-aminopyridine (X) is

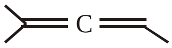


(a)  (b)  (c)  (d) 

57. The correct stability order of following species is


(x)


(y)


(z)


(w)

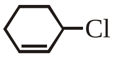
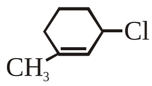
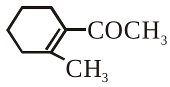
(a) x > y > w > z (b) y > x > w > z (c) x > w > z > y (d) z > x > y > w

58. Which of the following is unacceptable resonating structure of Buta-1, 2, 3-triene

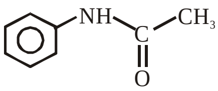
(a) $\overset{\ominus}{\ddot{C}}H_2 - C \equiv C - \overset{\oplus}{C}H_2$ (b) $CH_2 = C = C = CH_2$

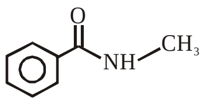
(c) $\overset{\oplus}{C}H_2 - C \equiv C - \overset{\ominus}{\ddot{C}}H_2$ (d) $\dot{C}H_2 - C \equiv C - \dot{C}H_2$

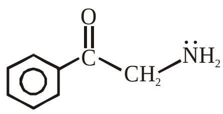
59. In which of the following molecules all the effects namely inductive, mesomeric and hyperconjugation operate

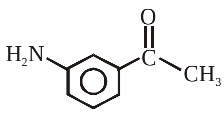
(a)  (b)  (c)  (d) 

60. The correct basic strength order is


I


II


III


IV

(a) I > II > IV > III (b) IV > III > II > I (c) III > II > IV > I (d) III > IV > II > I

Physics Class-XI Answers

1.	(b)	2.	(b)	3.	(b)	4.	(b)	5.	(b)
6.	(a)	7.	(a)	8.	(c)	9.	(c)	10.	(c)
11.	(a)	12.	(a)	13.	(b)	14.	(c)	15.	(a)
16.	(b)	17.	(d)	18.	(d)	19.	(d)	20.	(c)
21.	(d)	22.	(b)	23.	(c)	24.	(c)	25.	(d)
26.	(b)	27.	(a)	28.	(d)	29.	(a)	30.	(a)

Chemistry Class-XI Answers

31.	(d)	32.	(a)	33.	(c)	34.	(d)	35.	(d)
36.	(a)	37.	(b)	38.	(c)	39.	(b)	40.	(a)
41.	(d)	42.	(c)	43.	(d)	44.	(d)	45.	(a)
46.	(c)	47.	(d)	48.	(b)	49.	(a)	50.	(a)
51.	(b)	52.	(a)	53.	(c)	54.	(c)	55.	(b)
56.	(a)	57.	(c)	58.	(d)	59.	(c)	60.	(d)

SOLUTION OF CHEMISTRY

Sol.: 31. (d):

Sol.: 32. (a): $pH = pK_1 + \log \frac{[1N]}{[HI_4]}$

$5 = pK_1 + \log \frac{75}{3}$

$\Rightarrow \quad pK_1 = 4.523$

$\Rightarrow \quad K_1 = 3 \times 10–5$

$pH = 4.523 + \log \frac{10}{90} = 4.523 – 0.954 = 3.56$

Sol.: 33. (c): $NH_4OH + H^+ \rightleftharpoons NH_4^+ + H_2O \qquad K = 10^9$

SA

K_b of $NH_4OH = 10^9 + 10^{-14} = 10^{-5}$

Initial $pH = 7 - \frac{1}{2} pK_b - \frac{1}{2} \log c$

$pK_b = 5$ c = concentration of NH_4^+ (undergoes hydrolysis)

$= 0.05 \times 2 + 0.1 = 0.2$ M

$= 7 - \frac{1}{2} (5) - \frac{1}{2} \log (0.2) = 7 - 2.5 + 0.35 = 4.85.$

$NH_4^+ + OH^-$ from NaOH $\rightleftharpoons NH_4OH$ $\qquad pOH - pK_b + \log \frac{0.1 \times v}{0.1 \times v}$

$0.2 \times v \; 0.1 \times v$ $\qquad pK_b = 5$

$0.1 \times v \; 0 \qquad 0.1 \times v$ $\qquad$ It is Buffer

So change in pH = 9 – 4.85 = 4.15.

Sol.: 34. (d): Equivalents of $FeCO_2O_4$ = equivalents of $KMnO_4$

$\times$ (mole) $\times 3 = 1 \times 5$

$\times = \frac{5}{3}$

Sol.: 35. (d): Total mass of NaOH = 30 +90 = 120 gm

Total volume of solution = 100 + 100 = 200 ml

$\text{Molarity} = \frac{120/40}{200} \times 1000 = 15\text{ M}$

Sol.: 36. (a): KOH $\quad + \quad$ Na_2CO_3

a.M.e $\qquad$ b. M.e

$a + \frac{b}{2} = 15 \times \frac{1}{20}$

$2a + b = 1.5$ ...(i) (in presence of phenolphthalein)

$a + b = 25 \times \frac{1}{20} = 1.25$ ...(ii) (in presence of Methyl orange)

By solving (i) and (ii) a = 0.25 m.e

Mass of KOH $= \frac{0.25}{1000} \times 56 = 0.014$ gm

Sol.: 37. (b): $\Delta S \; nR\ln\left(\frac{V_f}{V_i}\right) = R\ln\left(\frac{V_i}{V_f}\right) = R\ln\left(\frac{300\,R}{1\,L \times 1\,atm}\right) = R\ln(24.6)$

Sol.: 38. (c): Since liquid is expanding against external pressure P_o hence work done.

$w = -P_o(4V_o - V_o) = -3P_oV_o$

Þ $\Delta U = w = -3P_oV_o$

$= -3P_oV_o + 4P_oV_o - 2P_oV_o$

Sol.: 39. (b): Kp = 0.800 atm $= P_{CO_2}$ = maximum pressure of CO_2 in the container to calculate maximum volume of container the $P_{CO_2} = 0.8$ atm and none of CO_2 should get converted into $CaCO_3(s)$.

So, V(0.800 atm) = (10 L) (0.2 atm)

So, V = 2.5 L

Sol.: 40. (a): $N_2 + 3H_2 \rightleftharpoons 2NH_2$

Due to addition of inert gas at constant pressure equilibrium will proceeds in the direction in which less numbers of gaseous moles are formed.

Sol.: 41. (d): (a) Mg $= 1s^2\,2s^2\,2p^6\,3s^2$; Al $= 1s^2\,2s^2\,2p^6\,3s^2\,3p^1$. As electron is to be removed from stable completely filled s-orbital of Mg as compared to partially filled p-orbital of Al.

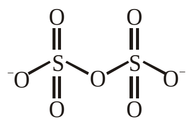
(b) Li^+ due to small in size attracts more no. of water molecules and thus have bigger hydrated ion.

(c) Addition of 2^{nd} e^- to an anion (same charge) is difficult due to the electrostatic repulsion.

All statements are true.

Sol.: 42. (c): $O^+ = 2s^2\,2p^3$ – half filled configuration has extra stability and $F^+ = 2s^2\,2p^4$ partially filled less stable thus IE_2 of O > F. As nuclear charge increases the IF_2 increases.

Sol.: 43. (d): M.O of $C_2 = \sigma_1 s^2 < \sigma_1^* s^2 < \sigma_2 s^2 < \sigma_2^* s^2 < \underbrace{\pi_2 p^2 y = \pi_2 p^2 z}_{\text{HOMO}} < \underbrace{\sigma_2 p_x}_{\text{LUNMO}}$

Sol.: 44. (d): 

In structure of $S_2O_7^{2-}$ there is one S–O–S bond but no. S–S bond.

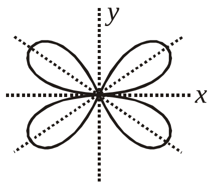
Sol.: 45. (a): Bond order = 1/2 (number of electron in BMO – Number of electron in ABMO)

Bond order of O_2^- = 1/2 (10 – 7) = 1.5; Bond order of NO^+ = 1/2 (10– 4) = 3

Bond order of CN^+ = 1/2 (9 – 4) = 2.5;

Bond order of CN^- = 1/2 (10 – 4) = 3;

Sol.: 46. (c): d_{xy}



Maximum probability at 45‘.

Sol.: 47. (d): Azimuthal quantum number gives the shape of orbital.

Sol.: 48. (b):

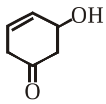
Sol.: 49. (a): Under different conditions of pressure and temperature.

Rate $\alpha \ \frac{P}{\sqrt{T.M}}$ $\quad \therefore \quad \frac{r_1}{r_2} = \frac{P_1}{P_2}.\sqrt{\frac{T_2M_2}{T_1M_1}}$

Sol.: 50. (a): $Zn^{2+} + 2NaOH \longrightarrow \underset{\text{(white ppt)}}{Zn(OH)_2} \xrightarrow{2\,NaOH} \underset{\text{Anionic part}}{Na_2\underline{ZnO_2}} + 2H_2O$

Sol.: 51. (b): $\underset{(X)}{3Mg} + N_2 \xrightarrow{\Delta} \underset{(Y)}{Mg_3N_2}$; $\quad Mg_3N_2 + 6H_2O \longrightarrow 3Mg(OH)_2 + \underset{\text{(Colourless gas)}}{2NH_3}$

Sol.: 52. (a): Due to planarity of (A), the free radical is stabilised but in (B) steric inhibition of resonance the free radical is less stable.

Sol.: 53. (c): The compound 

gives positive test with Na metal 2, 4-DNP and it gives single product with O_3.

Sol.: 54. (c): In 2, 4-Dinitrophenol both nitrosubstituents are involved in resonance stabilisation.

Sol.: 55. (b): No. of equivalents of $Na_2S_2O_3$ = no. of equivalents of I_2 = no. of equivalents of enol.

$\therefore$ No. of equivalents of enol $= \frac{10 \times .1}{1000} \times 1 = 10^{-3}$

Mass of enol $= 10^{-3} \times (120 + 32 + 10)$

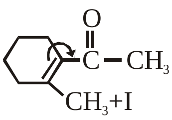
$= 10^{-3} \times 162 = 0.162$ gm

Sol.: 56. (a):

Sol.: 57. (c): X is a conjugated diene system, W is an isolated diene system.
Z is a cumulated diene system, Y is antiromantic system.
Hence stability order is X > W > Z > Y.

Sol.: 58. (d): $CH_2 = C = C = CH_2 \leftrightarrow \overset{\oplus}{C}H_2 - C \equiv C - \overset{\ominus}{C}H_2 \leftrightarrow \overset{\ominus}{C}H_2 - C \equiv C - \overset{\oplus}{C}H_2$

$\overset{\bullet}{C}H_2 - C \equiv C - \overset{\bullet}{C}H_2$ is unacceptable, as it has two unpaired electrons.

Sol.: 59. (c): 

has all effect inductive, mesomeric and hyperconjugation.

Sol.: 60. (d): The basicity order will be inversally proportional to resonacne stability of lone pair.