FIITJEE FARIDABAD

MOCK PRACTICE PAPER FOR

JEE -Mains- 2020

MOCK PRACTICE PAPER-18

Time: 3 hours | ***Maximum marks: 360***

INSTRUCTIONS

Caution: Question Paper CODE as given above MUST be correctly marked in the answer OMR sheet before attempting the paper. Wrong CODE or no CODE will give wrong results.

A. General Instructions

1. Attempt ALL the questions. Answers have to be marked on the OMR sheets.
2. This question paper contains Three Parts. **Part-1** is Chemistry, **Part-2** is Physics and **Part-3** is Mathematics.
3. Rough spaces are provided for rough work inside the question paper. No additional sheets will be provided for rough work.
4. Blank Papers, clip boards, log tables, slide rule, calculator, cellular phones, pagers and electronic devices, in any form, are not allowed.

B. Filling of OMR Sheet

1. Ensure matching of OMR sheet with the Question paper before you start marking your answers on OMR sheet.
2. On the OMR sheet, darken the appropriate bubble with HB pencil for each character of your Enrolment No. and write in ink your Name, Test Centre and other details at the designated places.
3. OMR sheet contains alphabets, numerals & special characters for marking answers.

C. Marking Scheme For All Sections.

(i) **Section-I (01 – 30)** contains **30** multiple choice questions which has **only one** correct answer. Each question carries **+4 marks** for correct answer and **-1** for wrong answer in this section.

Name of the Candidate :____

Batch :________________ **Date of Examination :**____________________

Enrolment Number :____

1. Thiosulphate reacts differently with iodine and bromine in the reaction given below:

$$2S_2O_3^{2-} + I_2 \longrightarrow S_4O_6^{2-} + 2I^-$$

$$S_2O_3^{2-} + 2Br_2 + 5H_2O \longrightarrow 2SO_4^{2-} + 2Br^- + 10H^+$$

Which of the following statements justifies the above dual behavior of thiosulphate?

(A)Bromine is a stronger oxidizing agent than iodine

(B) Bromine is a weaker oxidizing agent than iodine

(C) Thiosulphate undergoes oxidation by bromine and reduction by iodine is these reactions

(D) Bromine undergoes oxidation and iodine undergoes reduction in these reaction

2. In a hydrogen atom, the electron is at a distance of 4.768Å from the nucleus. The angular momentum of the electron is:

(A) $\frac{3h}{2\pi}$ (B) $\frac{h}{2\pi}$ (C) $\frac{h}{\pi}$ (D) $\frac{2h}{\pi}$

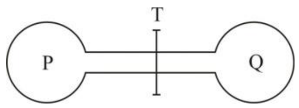
3. 

Figure shows two spherical containers P and Q connected by tap T. P contains an ideal gas at pressure 5×10^5 Nm^{-2} and temperature 300K. Q contains same gas at pressure $2\times10^5 Nm^{-2}$ and temperature 400K. If the tap is opened the final pressure becomes $m\times10^5$ Nm^{-2}. What is the value of m ? The volume of Q is four times the volume of P.

(A)1.4 (B) 1.8 (C) 2.4 (D) 2.8

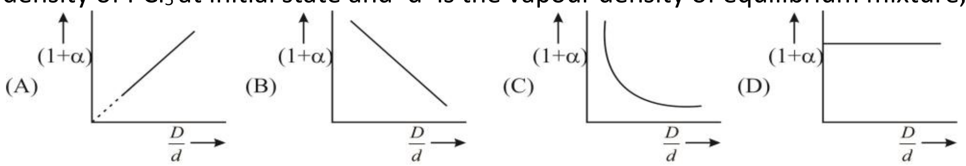
4. Which of the following thermodynamic relation correct?

(A) $dG = VdP - SdT$ (B) $dU = PdV + TdS$ (C) $dH = TdS - VdP$ (D) $dG = VdP + SdT$

5. The standard enthalpy of formation of NH_3 is –46kJ mol^{-1}. If the enthalpy of formation of H_2 form its atoms is – 435 kJ mol^{-1} and that of nitrogen is –712 kJ mol^{-1} , the average bond enthalpy of N–H bond in NH_3 is:

(A) $+1056kJ\ mol^{-1}$ (B) $-1102kJ\ mol^{-1}$ (C) $-964kJ\ mol^{-1}$ (D) $+352kJ\ mol^{-}$

6. For the dissociation of PCl_5 (g), the variation of $(1+\alpha)$ against $\left(\frac{D}{d}\right)$ is represented as: where 'D' is the vapour density of PCl_5 at initial state and 'd' is the vapour density of equilibrium mixture,



Space for rough work

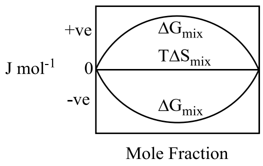
7. The pH of resultant solution of 20 mL of 0.1 M H_3PO_4 and 20 mL of 0.1 M Na_3PO_4 is :

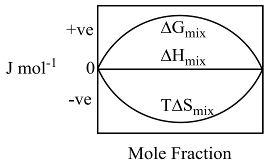
(A) pK_{a_1} (B) pK_{a_2} (C) $\dfrac{pK_{a_1}+pK_{a_2}}{2}$ (D) 2

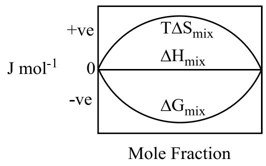
8. First three nearest neighbor distance for body centred cubic lattice are:

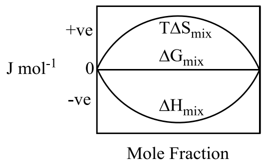
(A) $\sqrt{2}\,l, l, \sqrt{3}\,l$ (B) $\dfrac{1}{\sqrt{2}}, l, \sqrt{3}\,l$ (C) $\dfrac{\sqrt{3}\,l}{2}, l, \sqrt{2}l$ (D) $\dfrac{\sqrt{3}l}{2}, l, \sqrt{3}\,l$

9. Which of the following represents correctly the changes in thermodynamic properties during the formation of 1 mol of an ideal binary solution?

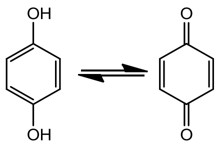
(A) 

(B) 

(C) 

(D) 

10. The cell reaction involving quinhydrone electron is:



$+ \ 2H^+ \ + \ 2e^- \ ; \ E° = 1.30$ volt

What will be the electrode potential at pH=3?

(A)1.48 V (B) 1.20V (C) 1.10 V (D) 1.30 V

11. Half-lives of a first order and a zero order reaction are same. Then the ratio of the initial rates of first order reaction to that of the zero order reaction is :

(A) $\dfrac{1}{0.693}$ (B) 2×0.693 (C) 0.693 (D) $\dfrac{2}{0.693}$

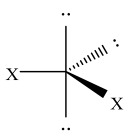
12. The coagulating power of an electrolyte for blood decreases in the order:

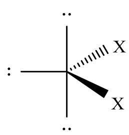
(A) Na^+, Al^{3+} , Ba^{2+} (B) $PO_4^{3-}, SO_4^{2-}, Cl^-$ (C) Al^{3+}, Ba^{2+}, Na^+ (D) $Cl^-, SO_4^{2-}, PO_4^{3-}$

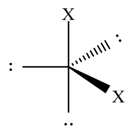
13. The correct order of I.E.$_2$. is:

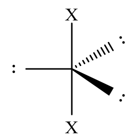
(A) $Na > F > O > N$ (B) $O > F > Ne > N$ (C) $Ne > O > F > N$ (D) $O > Ne > F > N$

14. According to the VSEPR theory, The most stable arrangement is:

(A) 

(B) 

(C) 

(D) 

15. Selec pair of compounds in which both have different hybridiazation but have same molecular geometry :

(A) BF_3, BrF_3 (B) ICl_2^- , $BeCl_2$ (C) BCl_3, PCl_3 (D) PCl_3, NCl_3

Space for rough work

16. The solubility of metal halides depends on their nature, lattice enthalpy and hydration enthalpy of the individual ions. Amongst fluorides of alkali metals, the lowest solubility of LiF in water is due to:

(A)Ionic hydration enthalpy of lithium ion
(B) High lattice enthalpy
(C)high hydration enthalpy of lithium ion
(D) Low ionisation enthalpy of lithium atom

17. The cyclotrimetaphosphoric acid is:

(A) $(HPO_3)_3$ and contains $9\sigma - bonds$
(B) $H_3P_3O_6$
(C) $(HPO_3)_3$ and contains 15σ bonds
(D) $H_3P_3O_9$ and contains 18σ bonds

18. Which of the following is not optically active?

(A) $\left[Co(en)_3\right]^{3+}$
(B) $\left[Cr(Ox)_3\right]^{3-}$
(C) $cis - \left[CoCl_2(en)_2\right]^{+}$
(D) $trans - \left[CoCl_2(en)_2\right]^{+}$

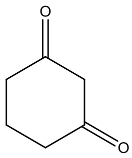
19. Which one among the following pairs of ions cannot be separated by H_2 S in dilute HCl?

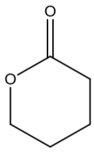
(A) Bi^{3+}, Sn^{2+}
(B) Al^{3+}, Hg^{2+}
(C) Zn^{2+}, Cu^{2+}
(D) Ni^{2+}, Cu^{2+}

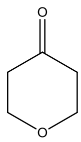
20. The purest variety of iron is called

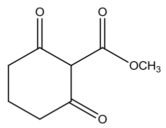
(A)Cementite
(B) Wrought iron
(C)Pig iron
(D) Steel

21. Arrange the following in increasing order of their acidic strength.

(I) 

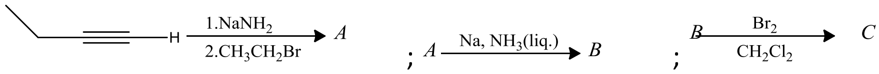
(II) 

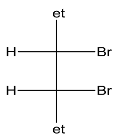
(III) 

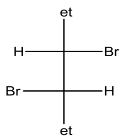
(IV) 

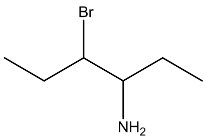
(A) $\mathrm{III > I > IV > II}$
(B) $\mathrm{II > I > IV > III}$
(C) $\mathrm{I > III > IV > iI}$
(D) $\mathrm{II < III < I < IV}$

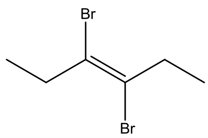
22. What is the final product, C, of the following reaction sequence?



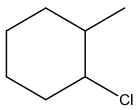
(A) 

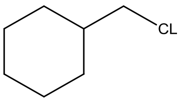
(B) 

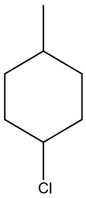
(C) 

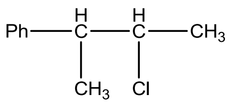
(D) 

23. S_{N^1} and S_{N^2} products are same with (excluding stereosiomear):

(A) 

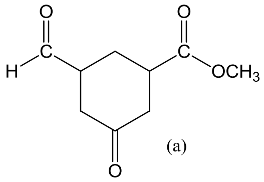
(B) 

(C) 

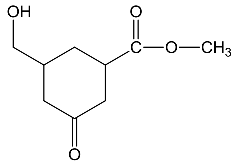
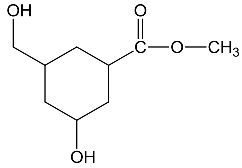
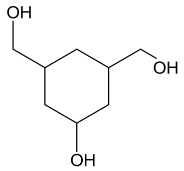
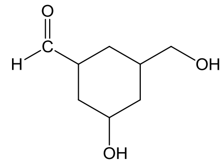
(D) 

Space for rough work

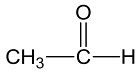
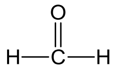
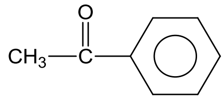
24. Predict the product when given compound reacts with $LiAlH_4$:



(a)

(A)  (B)  (C)  (D) 

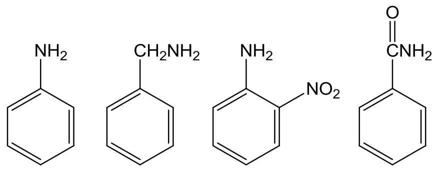
25. Correct order of reactivity of following compounds towards Grignard reagent?

(I) (II) (III)

(A) $I > II > III$ (B) $II > I > III$ (C) $II > III > I$ (D) $I > III > II$

26. Rank of the following compounds in order of increasing basic strength (Weakest →Strongest):



1 2 3 4

(A) $4<2<1<3$ (B) $4<3<1<2$ (C) $4<1<3<2$ (D) $2<1<3<4$

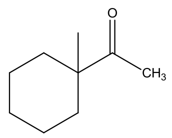
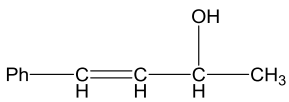
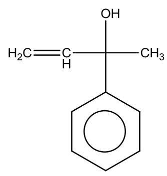
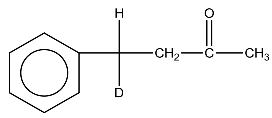
27. Rapid interconversion of α D- glucose $\beta - D$ -glucose in solution is known as:

(A) Recemization (B) asymmetric induction
(C) Fluxional isomerization (D) mutarotation

28. BHC and DDT act as

(A) carcinoges (B) allergens (C) asthmatic agents (D) all of these

29. Which of the following is incapable to show iodoform test?

(A)  (B)  (C)  (D) 

30. Which of the following is not the addition homopolymer

(A) Teflon (B) Buna-S (C) PVC (D) PAN

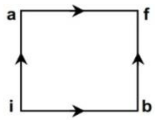
Space for rough work

1. A Carnot engine, having an efficiency of $\eta = 1/10$ as heat engine, is used as a refrigerator. If the work done on the system is 10 J, the amount of energy absorbed from the reservoir at lower temperature is
(A) 99 J (B) 90 J (C) 1 J (D) 100 J

2. The potential at a point x (measured in m) due to some charges situated on the x-axis is given by: $V(x) = 20/(x^2-4)$ volt. The electric field E at x = 4 m is given by:
(a) 5/3 V/m and in the –ve x direction (B) 5/3 V/m and in the +ve x direction
(c) 10/9 V/m and in the –ve x direction (D) 10/9V/m and in the +ve x direction

3. If g_E and g_M are the accelerations due to gravity on the surfaces of the earth and the moon respectively and if Millikan's oil drop experiment could be performed on the two surfaces, one will find the ratio electronic charge on the moon to be electronic charge on the earth
(A) 1 (B) zero (C) g_E / g_M (D) g_M / g_E

4. When a system is taken from a state i to state f along the path iaf, it is found that Q = 50 cal and W = 20 cal. Along the path ibf Q = 36 cal. W along the path ibf is
(A) 6 cal (B) 16 cal (C) 66 cal (D) 14 cal



5. A long straight wire of radius a carries a steady current i. the current is uniformly distributed across its cross-section. The ratio of the magnetic field at a/2 and 2a is
(A)1/4 (B) 4 (C) 1 (D) 1/2

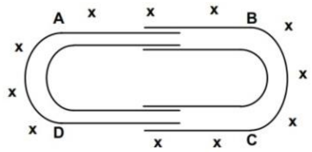
6. The half-life period of a radioactive element X is same as the mean life time of another radioactive element Y. Initially they have the same number of atoms. Then
(A) X will decay faster that Y (B) Y will decay faster than X
(C) Y and X have same decay rate initially (D) X and Y decay at same rate always

7. Carbon, silicon and germanium have four valence electrons each. At room temperature which one of the following statements is most appropriate?
(A) the number of free conduction electrons is significant in C but small in Si and Ge
(B) the number of free conduction electrons is negligibly small in all the three
(C) the number of free electrons for conduction is significant in all the three
(D) the number of free electrons for conduction is significant only in Si and Ge but small in C

8. A long solenoid has 200 turns/cm and carries a current i. the magnetic field at its centre is 6.28×10^{-2}Wb/m2. Another long solenoid has 100 turns/cm and it carries a current i/3. The value of the magnetic field at its centre is
(A) 1.05×10^{-2}Wb/m^2 (B) 1.05×10^{-5}Wb/m^2 (C) 1.05×10^{-3}Wb/m^2 (D) 1.05×10^{-4}Wb/m^2

Space for rough work

9. One conducting U-tube can slide inside another as shown in figure, maintaining electrical contacts between the tubes. The magnetic field B is perpendicular to the plane of the figure. If each tube moves towards the other at a constant speed v, then the emf induced in the circuit in terms of B, ℓ and v, where ℓ is the width of each tube, will be



(A) $B\ell v$ (B) $B\ell v$ (C) zero (D) $2B\ell v$

10. A charged particle moves in a uniform magnetic field perpendicular to it, with a radius of curvature 4 cm. On passing through a metallic sheet it looses half of its kinetic energy, then the radius of curvature of the particle is

(A) 2 cm (B) 4 cm (C) 8 cm (D) $2\sqrt{2}$ cm

11. Two massive particles of masses M & m (M > m) are separated by a distance ℓ. They rotate with equal angular velocity under their gravitational attraction. The linear speed of the particle of mass m is

(a) $\sqrt{\dfrac{GMn}{(M+m)\ell}}$ (b) $\sqrt{\dfrac{GM^2}{(M+m)\ell}}$ (c) $\sqrt{\dfrac{GM^2}{\ell}}$ (d) $\sqrt{\dfrac{Gm^2}{(M+m)\ell}}$

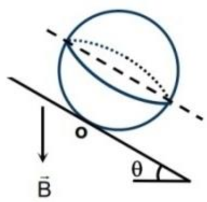
12. In an L-C circuit, C = 1F, L = 4H, at time t = 0, charge in the capacitor is 4C and it is decreasing at a rate of $\sqrt{5}$ C/s. Choose the correct statements.

(A) maximum charge in the capacitor can be 6C
(B) maximum charge in the capacitor can be 8C
(C) charge in the capacitor will be maximum after time $2\sin^{-1}(2/3)$ sec
(D) None of these

13. If one mole of a monoatomic gas (γ= 5/3) Is mixed with one mole of a diatomic gas (γ= 7/5), the value of γ for the mixture is

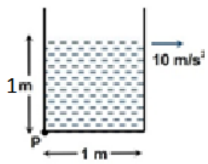
(A) 1.40 (B) 1.5 (C) 1.53 (D) 3.07

14. In the figure shown a coil of single turn is wound on a sphere of radius r and mass m. The plane of the coil is parallel to the inclined plane and lies in the equatorial plane of the sphere. If sphere is in rotational equilibrium the value of B is (current in the coil is i)



(A) $\dfrac{mg}{\pi ir}$ (B) $\dfrac{mg\sin\theta}{\pi i}$ (C) $\dfrac{mgr\sin\theta}{\pi i}$ (D) None of these

15. A container is filled with water, accelerating with acceleration 10 m/s^2, along +ve X-axis on a smooth horizontal surface. The velocity of efflux of water at a point P at the bottom of the tank and near its left most corner is



(A) 4.43 m/s (B) 5.48 m/s (C) 4 m/s (D) 3 m/s

Space for rough work

16. When a block of iron floats in mercury at 0°C, a fraction k_1 of its volume is submerged, while at the temperature 60° C, a fraction k_2 is seen to be submerged. If the coefficient of volume expansion of iron is γ_{Fe} and that of mercury is γ_{Hg}, then the ratio k_1/k_2 can be expressed as

(a) $\frac{1+60\gamma_{Fe}}{1+60\gamma_{Hg}}$ (b) $\frac{1-60\gamma_{Fe}}{1+60\gamma_{Hg}}$ (c) $\frac{1+60\gamma_{Fe}}{1-60\gamma_{Hg}}$ (d) $\frac{1+60\gamma_{Hg}}{1+60\gamma_{Fe}}$

17. Hot water cools from 60°C to 50°C in the first 10 minute and to 42°C in the next 10 minute. The temperature of the surroundings is

(A) 5°C (B) 10°C (C) 15°C (D) 20°C

18. Four drops of equal radius one falling through with a steady velocity of 5 cm/s. If the four drops coalsed then its terminal velocity will be:

(A) $4^{4/3}\times5$ cm/s (B) $4^{4/3}$ cm/s (C) $5^{4/3}\times4$ cm/s (D) $4^{2/3}\times5$cm/s

19. Find the position of centre of mass of a uniform disc of radius R from which a hole of radius r is cut out from the right part of the disc. The centre of the hole is at a distance R/2 from the centre of the disc.

(a) $\frac{Rr^2}{2\left(R^2-r^2\right)}$ towards right of O (b) $\frac{Rr^2}{2\left(R^2-r^2\right)}$ towards left of O

(c) $\frac{2Rr^2}{\left(R^2+r^2\right)}$ towards right of O (d) $\frac{2Rr^2}{\left(R^2+r^2\right)}$ towards left of O

20. A lead ball strikes a wall and fall down, a tennis ball having the same mass and velocity strikes the wall and bounces back. Check the correct statement

(a) The momentum of the lead ball is greater than that of the tennis ball

(b) The lead ball suffers a greater change in momentum compared with the tennis ball

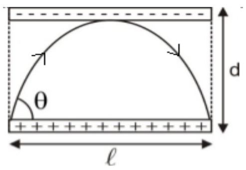
(c) The tennis ball suffers a greater change in momentum as compared with the lead ball.

(d) Both suffer an equal change in momentum.

21. A cuboid of dimension (a x b x c), having mass m, resistivity ρ, and density d is connected through ideal battery V volt across the opposite faces for three different situations, produces power P_1, P_2 and P_3 respectively. Given that $P_1 : P_2 : P_3 = 1:2:8$. Choose the correct option. (Given $a > b > c$)

(A) $c = \sqrt[3]{\frac{m}{4d}}$ (B) $c = \sqrt[3]{\frac{m}{4\sqrt{2}d}}$ (C) $a = \sqrt[3]{\frac{m}{4d}}$ (D) $a = \sqrt[3]{\frac{m}{2d}}$

22. An electron enters the region between the plates of a parallel plate capacitor at an angle θ to the lower plates. The width is ℓ the plate separation is d. The electron follows the path shown, just missing the upper plate. Neglect gravity. Then,



(a) $\tan\theta = \frac{2d}{\ell}$ (b) $\tan\theta = \frac{4d}{\ell}$

(c) $\tan\theta = \frac{8d}{\ell}$ (d) The data given is insufficient to find a relation between d, ℓ and θ

Space for rough work

23. In a screw guage, the linear distance travelled by the head scale is 5 mm in 10 complete rotations. There are 100 divisions on the circular scale of the screw guage. When the diameter of a wire is measured, the main scale reading is 2.5 mm and 30th circular division coincides with the main scale. There is no zero error in the screw guage. Two statements are given related to least count of the screw guage and the diameter of the wire.
Statement (i): The least count of screw guage is 0.005 mm
Statement (ii): The diameter of the wire is 2.65 mm
Choose the correct option regarding which statement is/are correct?

(A) only (i) is correct
(B) both (i) and (ii) are correct
(C) only (ii) is correct
(D) none of the above statement is correct

24. According to Einstein's equation $\mathrm{E} = \mathrm{mc}^2$. E represents the rest mass energy of an object with rest mass m. c is the speed of light in vacuum, and is given by $2.998 \text{ x} \frac{10^8 \mathrm{m}}{\mathrm{s}}$. Find the rest mass energy of electron whose rest mass is $9.11 \text{ x } 10^{-31}\mathrm{kg}$.
(A) $8.1881 \text{ x } 10^{-14}$ J
(B) $8.188 \text{ x } 10^{-14}$ J
(C) $8.19 \text{ x } 10^{-14}$ J
(D) $8.2 \text{ x } 10^{-14}$ J

25. For a given velocity, a projectile has the same range R for two angles of projection if t_1 and t_2 are the times of flight in the two cases then
(A) $t_1 t_2 \propto R^2$
(B) $t_1 t_2 \propto R$
(C) $t_1 t_2 \propto \frac{1}{R}$
(D) $t_1 t_2 \propto \frac{1}{R^2}$

26. A man standing on the roof of a house of height h throws one particle vertically downwards and another particle horizontally with the same velocity u. The ratio of their velocities when they reach the earth's surface will be
(a) $\sqrt{2gh + u^2} : u$
(b) 1:2
(c) 1:1
(d) $\sqrt{2gh + u^2} : \sqrt{2gh}$

27. A boy sitting on the topmost berth in the compartment of a train which is just going to stop on a railway station, drops an apple aiming at the open hand of his brother sitting vertically below his hands at a distance of about 2 meter. The apple will fall
(a) Precisely on the hand of his brother
(b) slightly away from the hand of his brother in the direction of motion of the train.
(c) slightly away from the hand in the direction opposite to the direction of motion of the train.
(d) None of the above

28. A block of mass m is placed on a smooth wedge of inclination θ. The whole system is accelerated horizontally so that the block does not slip on the wedge. The force exerted by the wedge on the block (g is acceleration due to gravity) will be
(a) mg $\cos\theta$
(b) mg $\sin\theta$
(c) mg
(d) mg/$\cos\theta$

29. The potential energy between two atoms in a molecule is given by $U(x) = \frac{a}{x^{12}} - \frac{b}{x^6}$ where a and b are positive constants and x is the distance between the atoms. The atom is in stable equilibrium when
(a) $x = \sqrt[6]{\frac{11a}{5b}}$
(b) $x = \sqrt[6]{\frac{a}{2b}}$
(c) x=0
(d) $x = \sqrt[6]{\frac{2a}{b}}$

30. A particle of mass m is moving in a horizontal circle of radius r under a centripetal force equal to $-K/r^2$, where K is a constant. The total energy of the particle is
(a) $\frac{K}{2r}$
(b) $-\frac{K}{2r}$
(c) $-\frac{K}{r}$
(d) $\frac{K}{r}$

Space for rough work

1. If the d.rs of two lines are given by the equations $l+m+n=0$ and $l^2+m^2-n^2=0$ then the d.rs of one of the two lines are

(A)0,0,–1 (B) 0, 1, –1 (C)1, 0, 1 (D)1, 0, 0

2. If the d.rs of OA and OB are $1,-1,-1$ *and* $2,-1,1$ then the d.cs of the line perpendicular to both OA and OB are

(A)0, 1, –1 (B)–2,–3,1 (C) $\frac{-2}{\sqrt{14}},\frac{-3}{\sqrt{14}},\frac{1}{\sqrt{14}}$ (D) $\frac{2}{\sqrt{14}},\frac{3}{\sqrt{14}},\frac{1}{\sqrt{14}}$

3. A plane which passes through the point (3,2,0) and the line $\frac{x-4}{1}=\frac{y-7}{5}=\frac{z-4}{4}$ is

(A) $x-y+z=1$ (B) $x+y+z=5$ (C) $x-2y-z=1$ (D) $2x-y+z=5$

4. $P(A)=\frac{3}{8},P(B)=\frac{1}{3}\ \&\ P(A\cap B)=\frac{1}{4}$ then $P(\bar{A}\cap\bar{B})=\frac{1}{4}$ equals

(A) 5/12 (B)7/24 (C)13/24 (D)17/24

5. The probability that the birthdays of 6 boys will fall exactly in 3 calendar months is

(A) $\frac{{}^{12}C_3\times(3^6-3)}{12^6}$ (B) $\frac{{}^{12}C_3\times 3^6}{12^6}$ (C) $\frac{{}^{12}C_3\times 192}{12^6}$ (D) $\frac{{}^{12}C_3\times 540}{12^6}$

6. In triangle ABC, Coordinates of the two vertices B and C are (2, 0) and (8, 0) respectively. The third vertex A is varying in such a way that $4\tan\frac{B}{2}\tan\frac{C}{2}=1$. Then locus of A is

(A) $\frac{(x-5)^2}{25}+\frac{y^2}{9}=1$ (B) $\frac{(x-5)^2}{16}+\frac{y^2}{25}=1$ (C) $\frac{(x-5)^2}{25}+\frac{y^2}{16}=1$ (D) $\frac{(x-5)^2}{25}-\frac{y^2}{9}=1$

7. The value of $\cos^2 10^\circ+\cos^2 15^\circ+\cos^2 20^\circ+.....+\cos^2 365^\circ$ =

(A) 34 (B)36 (C)35 (D)37/2

8. If $x^2+y^2+z^2=r^2$ and $\tan\alpha=\frac{xy}{zr},\tan\beta=\frac{yz}{xr},\tan\gamma=\frac{zx}{yr}$ then $\alpha+\beta+\gamma=$

(A) $\pi/4$ (B) $\pi/2$ (C) $\pi/3$ (D) π

9. If $f(x)$ is an odd periodic function with period 2, then $f(4)$ =

(A) 0 (B) 2 (C) 4 (D) – 4

Space for rough work

10. If $\begin{vmatrix} \cos(A+B) & -\sin(A+B) & \cos 2B \\ \sin A & \cos A & \sin B \\ -CosA & \sin A & \cos B \end{vmatrix} = 0$ then B =

(A) $n\pi$ (B) $(2n+1)\pi$ (C) $(2n+1)\frac{\pi}{2}$ (D) $2n\pi$

11. If t_1 and t_2 are the roots of the equation $t^2 + \lambda t + 1 = 0$. Where λ is an arbitrary constant. Then the line joining the points $\left(at_1^2, 2at_1\right)$ and $\left(at_1^2, 2at_2\right)$ always passes through a fixed point

(A)(a, 0) (B)(–a, 0) (C)(0, a) (D)(0, –a)

12. If $\frac{x}{a} + \frac{y}{b} = 1$ is a variable line where $\frac{1}{a^2} + \frac{1}{b^2} = \frac{1}{c^2}$ (c-constant). The locus of the foot of the perpendicular drawn from origin on the line $\frac{x}{a} + \frac{y}{b} = 1$ then

(A) $x^2 + y^2 = c^2$ (B) $x^2 + y^2 = 2c^2$ (C) $x^2 + y^2 = \frac{c^2}{2}$ (D) $x^2 + y^2 = \frac{1}{c^2}$

13. $f(x+y) = f(x) \times f(y)$ for all x and y, $f(1) = 2$, then area enclosed by $3|x| + 2|y| \le 8$ is

(A) f(5)square units (B)f(6) square units (C)f(6)/3 square units (D) f(4)square units

14. If $p, x_1, x_2, x_3 ..... \& \ q, y_1, y_2, y_3 ....$ form two infinite A.P's with common difference a and b respectively then the locus of $P(\alpha, \beta)$ where $\alpha = \frac{x_1 + x_2 + ... + x_n}{n}, \beta = \frac{y_1 + y_2 + ... + y_n}{n}$

(A) $a(x-p) = b(y-1)$ (B) $p(x-a) = q(y-b)$ (C) $p(x-p) = b|x-q|$ (D) $b(x-p) = a(y-q)$

15. If z_1 and z_2 are lying on $|z-3| \le 4$ and $|z-1| + |z+1| = 3$ respectively then range of $|z_1 - z_2|$ is

(A) $[0, \infty]$ (B) $[0, 1]$ (C) $\left[0, \frac{17}{2}\right]$ (D) $\left[0, \frac{3}{2}\right]$

16. Domain of the function $f(x) = \sqrt{\sin^{-1}(2x) + \frac{\pi}{6}}$

(A) $\left[\frac{-1}{4}, \frac{1}{2}\right]$ (B) $\left[\frac{-1}{2}, \frac{1}{2}\right]$ (C) $\left(\frac{-1}{2}, \frac{1}{2}\right)$ (D) $\left[\frac{-1}{4}, \frac{1}{4}\right]$

17. $\int \frac{x^4 + 1}{1 + x^6} dx =$

(A) $\tan^{-1} x - \tan^{-1}\left(x^3\right) + c$ (B) $\tan^{-1} x - \frac{1}{3}\tan^{-1}\left(x^3\right) + c$ (C) $\tan^{-1} x + \tan^{-1}\left(x^3\right) + c$ (D) $\tan^{-1} x + \frac{1}{3}\tan^{-1}\left(x^3\right) + c$

Space for rough work

18. $f(x)=\frac{x}{\sin x}\ \&\ g(x)=\frac{x}{\tan x}$ where $0<x\le 1$. Then in this interval

(A) f(x) and g(x) both are increasing (B)f(x) is decreasing and g(x) is increasing

(C)f(x) is increasing and g(x) is decreasing (D)none of the above

19. $f(x)=x^4-10x^3+35x^2-50x+c$ where c is a constant. the number of real roots of $f'(x)=0$ and $f''(x)=0$ are respectively

(A)1 , 0 (B)3 , 2 (C)1 , 2 (D) 3 , 0

20. $\sum_{r=1}^{n} t_r=\frac{1}{12}n(n+1)(n+2)$ then value $\sum\frac{1}{t_r}$

(A) $\frac{2n}{n+1}$ (B) $\frac{n-1}{(n+1)!}$ (C) $\frac{4n}{(n+1)}$ (D) $\frac{3n}{(n+2)}$

21 Equation of a curve passing through (3, 4) and satisfying the differential equation.

$y\left(\frac{dy}{dx}\right)^2+(x-y)\frac{dy}{dx}-x=0$ can be

(A) $x+y+1=0$ (B) $x+y+7=0$ (C) $x^2+y^2=25$ (D) $x^2+y^2-5x=10$

22. If $\lim_{x\to 0}\frac{\left(3\tan^{-1}x+3\tan x-x^5-6x\right)}{3x^n}$ is a finite number, then the greatest value of n is

(A)3 (B)5 (C)2 (D) 7

23. If P is a point $(2,4)$ on the parabola $y^2=8x$ and PQ is a focal chord, the coordinate of the mirror image of Q with respect to tangent at P are given by

(A) $(6,4)$ (B) $(-6,4)$ (C) $(2,4)$ (D) $(6,2)$

24. if $y=a\log|x|+bx^2+x$ has its extremum values at $x=-1$ and $x=2$ then

(A) $a=2,b=-1$ (B) $a=2,b=-\frac{1}{2}$ (C) $a=2,b=\frac{1}{2}$ (D) $a=-2,b=-\frac{1}{2}$

25. If $A=\begin{bmatrix} i & -i \\ -i & i \end{bmatrix}$ and $B=\begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix}$, then A^8 equals

(A)4B (B) 128 B (C)–128 B (D) –64 B

Space for rough work

26. If a circle passes through the point (a,b) and cuts the circle $x^2+y^2=p^2$ orthogonally, then the equation of the locus of its centre is

(A) $2ax+2by-\left(a^2+b^2+p^2\right)=0$
(B) $x^2+y^2-2ax+3by+\left(a^2-b^2-p^2\right)=0$
(C) $2ax+2by-\left(a^2-b^2+p^2\right)=0$
(B) $x^2+y^2-3ax-4by+\left(a^2+b^2-p^2\right)=0$

27. If $5\{x\}=x+[x]$ and $x-[x]=\frac{1}{2}$ (where {x} and [x] are functional an integral part of x) then 'x' is

(A)1/2 (B)3/2 (C)5/2 (D) 7/2

28. If the roots of equation $x^2-2ax+a^2+a-3=0$ are less than 3, then

(A)$a<2$ (B)$a>4$ (C)$3<a<4$ (D)$2<a<4$

29. The area of the figure bounded by two branches of the curve $(y-x)^2=x^3$ and the straight line x = 1 is

(A)1/3 sq.unit (B)4/5 sq.unit (C)5/4 sq.unit (D)3sq.unit

30. In $\Delta ABC,\ 3\sin A+4\cos B=6$ and $3\cos A+4\sin B=1$ then, the measure of an angle C in degrees, is

(A)30 (B)60 (C)150 (D)30 or 150

Space for rough work

CHEMISTRY		PHYSICS		MATHEMATICS	
1	A	1	B	1	B
2	A	2	D	2	C
3	B	3	A	3	A
4	A	4	A	4	C
5	D	5	C	5	D
6	A	6	B	6	C
7	B	7	D	7	B
8	C	8	A	8	B
9	C	9	D	9	A
10	A	10	D	10	C
11	B	11	B	11	B
12	C	12	A	12	A
13	C	13	B	13	C
14	D	14	A	14	D
15	B	15	B	15	C
16	B	16	A	16	A
17	C	17	B	17	D
18	D	18	D	18	C
19	A	19	B	19	B
20	B	20	C	20	C
21	D	21	B	21	C
22	A	22	B	22	D
23	C	23	B	23	B
24	C	24	C	24	B
25	B	25	B	25	B
26	B	26	C	26	A
27	D	27	B	27	B
28	A	28	D	28	A
29	C	29	D	29	B
30	B	30	B	30	A