

**ANNEXURE VII**  
**MODEL QUESTIONS**  
**MATHEMATICS**

1. The value of  $\cot(2 \cos^{-1}(4/5))$  is

- (a)  $\frac{16}{25}$       (b)  $\frac{7}{24}$       (c)  $\frac{21}{24}$       (d)  $\frac{9}{25}$ .

2. If  $(xe)^y = e^x$ , then  $\frac{dy}{dx}$  at  $x = e$  is

- (a)  $1/4$       (b)  $0$       (c)  $1$       (d)  $1/2$ .

3. The lines  $x - 2y + 4 = 0$  and  $2x - 3y + 7 = 0$  are the diameters of the circle whose area is 132 sq. units. The equation of this circle is ( $\pi = 22/7$ )

- (a)  $x^2 + y^2 + 4x + 2y - 37 = 0$       (c)  $x^2 + y^2 + 4x - 2y - 37 = 0$   
(b)  $x^2 + y^2 - 4x + 2y - 37 = 0$       (d)  $x^2 + y^2 - 4x - 2y - 37 = 0$

4. The value of  $\int_1^{e^{37}} \frac{\pi \sin(\pi \log x)}{x} dx$  is

- (a)  $e$       (b)  $2$       (c)  $\log e^{37}$       (d)  $1$ .

5. If the mean and standard deviation of a binomial distribution are '20' and '2', then the number of trials is

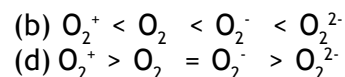
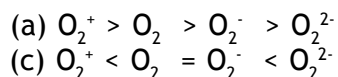
- (a) 40      (b) 80      (c) 25      (d) 50.

## PHYSICS

1. The magnitude of acceleration of a mass sliding along an incline making  $30^\circ$  angle with vertical is  
(a)  $g/2$                       (b)  $\sqrt{3}g/2$                       (c)  $g/\sqrt{2}$                       (d)  $g/\sqrt{3}$
  
2. The magnitudes of electric field generated by a charge  $Q$  at origin is measured at point A with coordinates  $(3,4,5)$  and at point B with coordinates  $(-5,3,-4)$ , Then,  
(a) the magnitude of the field is higher at A  
(b) the magnitude of the field is higher at B  
(c) the magnitudes of the field is same at A and B  
(d) no definite statement can be made regarding the relative magnitudes
  
3. The work done in forming a bubble of radius  $r$  from a liquid of surface tension  $\sigma$  is  $W$ . What will be the work done to form a bubble of radius  $3r$  from a liquid of surface tension  $2\sigma$ ?  
(a)  $6W$                       (b)  $12W$                       (c)  $18W$                       (d)  $36W$
  
4. What is the magnetic flux crossing unit area of  $xy$  plane generated by magnetic induction  $\mathbf{B}=10(\mathbf{i} +2\mathbf{j} +.4\mathbf{k})$ ? All quantities are in SI units.  
(a)  $10 \text{ Wb}$                       (b)  $20 \text{ Wb}$                       (c)  $40 \text{ Wb}$                       (d)  $\sqrt{21} \text{ Tesla}$
  
5. Which photon carries the highest momentum?  
(a) X-ray photon                      (b) Ultra violet photon  
(c) Infra red photon                      (d) Microwave photon

## CHEMISTRY

1. The relative stabilities of the following species are



2. An aqueous solution freezes at  $-0.186^\circ\text{C}$ . Given  $K_f = 1.86$  and  $K_b = 0.512$ , what will be the elevation in boiling point of the solution?

- (a)  $0.186^\circ\text{C}$       (b)  $-0.186^\circ\text{C}$       (c)  $0.0512^\circ\text{C}$       (d)  $0.512^\circ\text{C}$

3. In group 13 elements, the decreasing stability of higher oxidation state with increasing atomic number is because of

- (a) the decrease in bond energy with decrease in size
- (b) the increase in bond energy with decrease in size
- (c) the increase in bond energy with increase in size
- (d) the decrease in bond energy with increase in size

4. From potential energy considerations, the conformations of n-butane follow the order:

- (a) staggered < gauche < eclipsed < fully eclipsed
- (b) staggered < gauche < eclipsed = fully eclipsed
- (c) staggered < gauche = eclipsed < fully eclipsed
- (d) staggered = gauche < eclipsed < fully eclipsed

5. The acidic character of carboxylic acids is due to resonance stabilization of carboxylate ion. Electron releasing groups such as alkyl groups will

- (a) increase the negative charge on the carboxylate ion and hence destabilizes it
- (b) increase the negative charge on the carboxylate ion and hence stabilizes it
- (c) decrease the negative charge on the carboxylate ion and hence destabilizes it
- (e) decreases the negative charge on the carboxylate ion and hence stabilizes it