



JAWAHARLAL INSTITUTE OF  
POSTGRADUATE MEDICAL  
EDUCATION & RESEARCH



# JIPMER MBBS

SAMPLE PAPER 2013



# JIPMER

## Medical Entrance Exam

### Solved Paper 2013

#### Physics

- A car of mass 1000 kg moves on a circular track of radius 40 m. If the coefficient of friction is 1.28. The maximum velocity with which the car can be moved, is
  - 22.4 m/s
  - 112 m/s
  - $\frac{0.64 \times 40}{1000 \times 100}$  m/s
  - 1000 m/s
- The escape velocity for the earth is 11.2 km/s. The mass of another planet 100 times mass of earth and its radius is 4 times radius of the earth. The escape velocity for the planet is
  - 280 km/s
  - 56.0 km/s
  - 112 km/s
  - 56 km/s
- Light travels faster in air than that in glass. This is accordance with
  - wave theory of light
  - corpuscular theory of light
  - neither (a) nor (b)
  - Both (a) and (b)
- The speed of air flow on the upper and lower surfaces of a wing of an aeroplane are  $v_1$  and  $v_2$  respectively. If  $A$  is the cross section area of the wing and  $\rho$  is the density of air, then the upward lift is
  - $\frac{1}{2} \rho A (v_2 - v_1)$
  - $\frac{1}{2} \rho A (v_1 + v_2)$
  - $\frac{1}{2} \rho A (v_1^2 - v_2^2)$
  - $\frac{1}{2} \rho A (v_1^2 + v_2^2)$
- A body is thrown with a velocity of 9.8 m/s making an angle of  $30^\circ$  with the horizontal. It will hit the ground after a time
  - 1.5s
  - 1s
  - 3s
  - 2s
- A radioactive element  ${}_{90}\text{X}^{238}$  decays into  ${}_{82}\text{Y}^{222}$ . The number of  $\beta$ -particles emitted are
  - 1
  - 2
  - 4
  - 6
- Minimum excitation potential of Bohr's first orbit in hydrogen atom is
  - 3.6 V
  - 10.2 V
  - 13.6 V
  - 3.4 V
- A gas expands  $0.25 \text{ m}^3$  at constant pressure  $10^5 \text{ N/m}^2$ , the work done is
  - 250 N
  - 250 W
  - 250 J
  - 2.5 erg
- The work done in increasing the size of a soap film for  $10 \text{ cm} \times 6 \text{ m}$  to  $10 \text{ cm} \times 11 \text{ cm}$  is  $3 \times 10^{-4} \text{ J}$ . The surface tension of the film is
  - $1.0 \times 10^{-2} \text{ N/m}$
  - $6.0 \times 10^{-2} \text{ N/m}$
  - $3.0 \times 10^{-2} \text{ N/m}$
  - $1.5 \times 10^{-2} \text{ N/m}$



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10. A parallel plate condenser is filled with two dielectrics as shown in figure. Area of each plate is  $A \text{ m}^2$  and the separation is  $d$  metre. The dielectric constants are  $K_1$  and  $K_2$  respectively. Its capacitance in farad will be



- (a)  $\frac{2\epsilon_0 A}{d} \left( \frac{K_1 + K_2}{K_1 K_2} \right)$   
(b)  $\frac{2\epsilon_0 A}{d} \left( \frac{K_1 K_2}{K_1 + K_2} \right)$   
(c)  $\frac{\epsilon_0 A}{d} \left( \frac{K_1 + K_2}{2K_1 K_2} \right)$   
(d)  $\frac{\epsilon_0 A K_1 K_2}{2(d_1 K_1 + d_2 K_2)}$

11. A luminous object is placed at a distance of 30 cm from the convex lens of focal length 20 cm. On the other side of the lens, at what distance from the lens a convex mirror of radius of curvature 10 cm be placed in order to have an upright image of the object coincident with it

- (a) 30 cm (b) 80 cm  
(c) 50 cm (d) 12 cm

12. A battery of emf 10 V and internal resistance of 0.5 ohm is connected across a variable resistance  $R$ . The maximum value of  $R$  is given by

- (a) 0.5Ω (b) 1.00Ω (c) 2.0Ω (d) 0.25Ω

13. For a gas  $\frac{R}{C_v} = 0.67$ . This gas is made up of

molecules which are

- (a) mono atomic  
(b) poly atomic  
(c) mixture of diatomic and poly atomic molecules  
(d) diatomic

14. A point source of light is placed 4 m below the surface of water of refractive index  $5/3$ . The minimum diameter of a disc which should be placed over the source on the surface of water to cut-off all light coming out of water is

- (a) 6 m (b) 3 m (c) 4 m (d) 2 m

15. A moving body of mass  $m$  and velocity 3 km/h collides with a rest body of mass 2 m and stick to it. Now the combined mass starts to move. What will be the combined velocity?

- (a) 4 km/h (b) 1 km/h  
(c) 2 km/h (d) 3 km/h

16. A transverse wave is represented by the equation

$$y = y_0 \sin \frac{2\pi}{\lambda} (vt - k)$$

For what value of  $\lambda$  is the particle velocity equal to two times the wave velocity

- (a)  $\lambda = \pi y_0$  (b)  $\lambda = \frac{\pi y_0}{2}$   
(c)  $\lambda = \frac{\pi y_0}{3}$  (d)  $\lambda = 2\pi y_0$

17. Ionisation potential of hydrogen atom is 13.6 eV. Hydrogen atom on the ground state rarely excited by monochromatic radiation of photon 12.1 eV. The spectral line emitted by a hydrogen atom according to Bohr's theory will be

- (a) one (b) two  
(c) three (d) four

18. The internal resistance of a primary cell is 4Ω. It generates a current of 0.2 A in an external resistance of 21Ω. The rate at which chemical energy to consumed in providing current is

- (a) 1 J/s (b) 5 J/s  
(c) 0.42 J/s (d) 0.8 J/s

19. The binding energy per nucleon is maximum in the case

- (a)  ${}_{92}^{238}\text{U}$  (b)  ${}_{56}^{141}\text{Ba}$   
(c)  ${}_{26}^{56}\text{Fe}$  (d)  ${}_{2}^4\text{He}$





20. Two rigid bodies  $A$  and  $B$  rotate with rotational kinetic energies  $E_A$  and  $E_B$  respectively. The moments of inertia of  $A$  and  $B$  about the axis of rotation are  $I_A$  and  $I_B$  respectively.

If  $I_A = \frac{I_B}{4}$  and  $E_A = 100 = E_B$ , the ratio of angular momentum ( $L_A$ ) of  $A$  to the angular momentum ( $L_B$ ) of  $B$  is

- (a) 25 (b) 5/4 (c) 5 (d) 1/4
21. The working principle of a ball point pen is  
(a) Bernoulli's theorem (b) surface tension  
(c) gravity (d) viscosity
22. Progressive waves are represented by the equation

$$y_1 = a \sin(\omega t - x)$$

and  $y_2 = b \cos(\omega t - x)$

The phase difference between waves is

- (a)  $0^\circ$  (b)  $45^\circ$  (c)  $90^\circ$  (d)  $180^\circ$
23. Two simple pendulums of length 0.5 m and 20 m respectively are given small linear displacement in one direction at the same time. They will again be in the phase when the pendulum of shorter length has completed  $x$  oscillations, where  $k$  is  
(a) 1 (b) 3 (c) 2 (d) 5
24. A balloon contains 500 m<sup>3</sup> of helium at 27°C and 1 atmosphere pressure. The volume of the helium at -3°C temperature and 0.5 atmosphere pressure will be  
(a) 1000 m<sup>3</sup> (b) 900 m<sup>3</sup>  
(c) 700 m<sup>3</sup> (d) 500 m<sup>3</sup>
25. 220 V, 50 Hz, AC source is connected to an inductance of 0.2 H and a resistance of 20 Ω in series. What is the current in the circuit?  
(a) 3.33 A (b) 33.3 A (c) 5 A (d) 10 A
26. In 0.2 s, the current in a coil increases from 2.0 A to 3.0 A. If inductance of coil is 60 mH, then induced current in external resistance of 3 Ω will be  
(a) 1 A (b) 0.5 A  
(c) 0.2 A (d) 0.1 A

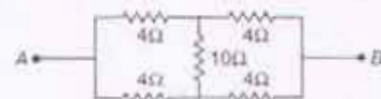
27. Two coherent light beams of intensities  $I$  and  $4I$  are superposed. The maximum and minimum possible intensities in the resulting beam are

- (a)  $5I$  and  $I$  (b)  $5I$  and  $3I$   
(c)  $9I$  and  $I$  (d)  $9I$  and  $3I$

28. A galvanometer acting as a voltmeter should have

- (a) low resistance in series with its coil  
(b) low resistance in parallel with its coil  
(c) high resistance in series with its coil  
(d) high resistance in parallel with its coil

29. The equivalent resistance across  $A$  and  $B$  is



- (a) 2 Ω (b) 3 Ω (c) 4 Ω (d) 5 Ω

30. A black body has a wavelength of  $\lambda$  at temperature 2000 K. Its corresponding wavelength at temperature 3000 K will be

- (a)  $\frac{2\lambda}{3}$  (b)  $\frac{3\lambda}{2}$   
(c)  $\frac{4\lambda}{9}$  (d)  $\frac{9\lambda}{4}$

31. At room temperature, copper has free electron density of  $8.4 \times 10^{28} \text{ m}^{-3}$ . The electron drift velocity in a copper conductor of cross-sectional area of  $10^{-6} \text{ m}^2$  and carrying a current of 5.4 A, will be

- (a)  $4 \text{ ms}^{-1}$  (b)  $0.4 \text{ ms}^{-1}$   
(c)  $4 \text{ cm s}^{-1}$  (d)  $0.4 \text{ mm s}^{-1}$

32. A uniform wire of resistance  $R$  and length  $L$  is cut into four equal parts, each of length  $L/4$  which are then connected in parallel combination. The effective resistance of the combination will be

- (a)  $R$   
(b)  $4R$   
(c)  $\frac{R}{4}$   
(d)  $\frac{R}{16}$

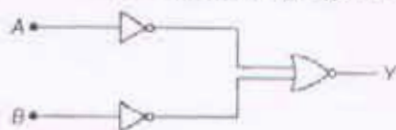


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33. The half-life of radio isotope is 4 h. If initial mass of the isotope was 200 g, then mass remaining after 24 h will be

- (a) 1.042 g (b) 2.084 g  
(c) 3.125 g (d) 4.167 g

34. Which logic gate is represented by the following combination of logic gates?



- (a) OR (b) NOR  
(c) AND (d) NAND

35. The work function for metals A, B and C are respectively 1.92 eV, 2.0 eV and 5eV. According to Einstein's equation the metals which will emit photo, electrons for a radiation of wavelength 4100 Å is/are

- (a) none (b) A only  
(c) A and B only (d) All the three metals

36. Two boys are standing at the ends A and B of a ground, where  $AB = a$ . The boy at B starts running in a direction perpendicular to AB with velocity  $v_1$ . The boy at A starts running simultaneously with velocity  $v$  and catches the other boy in a time  $t$ , where  $t$  is

$$(a) \frac{a}{\sqrt{v^2 + v_1^2}} \quad (b) \sqrt{\frac{a^2}{v^2 - v_1^2}}$$
$$(c) \frac{a}{(v - v_1)} \quad (d) \frac{a}{(v + v_1)}$$

37. A 5 amp fuse wire can withstand a maximum power of 1 W in circuit. The resistance of the fuse wire is

- (a) 0.2 Ω (b) 5 Ω (c) 0.4 Ω (d) 0.04 Ω

38. A force  $F$  is given  $F = at + bt^2$ , where,  $t$  is time. What are the dimensions of  $a$  and  $b$ ?

- (a)  $[MLT^{-1}]$  and  $[MLT^0]$  (b)  $[MLT^{-2}]$  and  $[ML^2T^{-4}]$   
(c)  $[MLT^{-1}]$  and  $[MLT^1]$  (d)  $[MLT^{-3}]$  and  $[MLT^{-4}]$

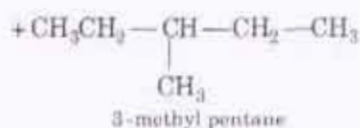
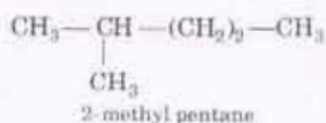
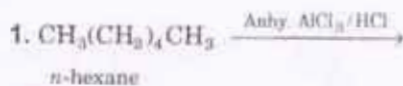
39. Two equal negative charges  $-q$  are fixed at the point  $(0, a)$  and  $(0, -a)$  on the  $y$ -axis. A positive charge  $Q$  is released from rest at the point  $(2a, 0)$  on the  $x$ -axis. The charge will

- (a) execute SHM about the origin  
(b) move to the origin and remain at rest  
(c) move to infinity  
(d) execute oscillatory but not SHM

40. An ice-cube of density  $900 \text{ kg/m}^3$  is floating in water of density  $1000 \text{ kg/m}^3$ . The percentage of volume of ice-cube outside the water is

- (a) 20% (b) 35% (c) 10% (d) 25%

## Chemistry



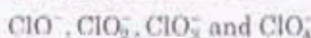
The above reaction is known as

- (a) acornatisation (b) pyrolysis  
(c) isomerisation (d) oxidation

2. Number of hydrogen-bonded water molecules associated in  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$  is

- (a) one (b) two  
(c) three (d) All the five

3. Which of the following species do not show disproportionation on reaction?



- (a)  $\text{ClO}_4^-$  (b)  $\text{ClO}_2^-$   
(c)  $\text{ClO}^-$  (d) None of these



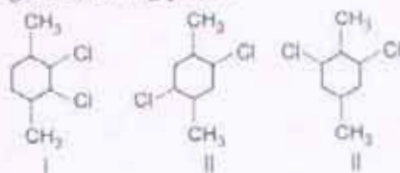
4. Which one of the following acts as a nucleophile?

- (a)  $(\text{CH}_3)_3\text{N}$  (b)  $\text{BF}_3$   
(c)  $\text{NO}_2$  (d)  $\text{CH}_3-\overset{\ominus}{\text{C}}=\text{O}$

5. During estimation of nitrogen in the organic compound by Kjeldahl's method, the ammonia evolved from 0.5 g of the compound in Kjeldahl's estimation of nitrogen, neutralised 10 mL of 1M  $\text{H}_2\text{SO}_4$ . Find out the percentage of nitrogen in the compound.

- (a) 14% (b) 28% (c) 56% (d) 68%

6. Which of the following compounds have highest melting point?



- (a) Only I (b) Only II (c) I and II (d) II and III

7. Identify the major product 'X' obtained in the following reaction.



- (a)  $\text{CH}_3-\overset{\text{CH}_3}{\underset{\text{CH}_3}{\text{C}}}=\overset{\text{CH}_3}{\text{C}}-\text{CH}_3$   
(b)  $\text{CH}_3-\overset{\text{CH}_3}{\text{CH}}-\overset{\text{CH}_3}{\text{C}}=\text{CH}_2$   
(c)  $\text{CH}_2=\overset{\text{CH}_3}{\text{C}}-\overset{\text{CH}_3}{\text{C}}-\text{CH}_2$   
(d)  $\text{CH}_3-\text{CH}_2-\overset{\text{CH}_3}{\text{C}}=\text{CH}_2$

8. Addition of water to alkynes occurs in acidic medium and in the presence of  $\text{Hg}^{2+}$  ions as a catalyst. Which of the following products will be formed on addition of water to but-1-yne under these conditions?

- (a)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CHO}$  (b)  $\text{CH}_3\text{CH}_2\text{COCH}_3$   
(c)  $\text{CH}_3\text{CH}_2\text{COOH} + \text{CO}_2$  (d)  $\text{CH}_3\text{COOH} + \text{HCHO}$

9. The correct order of increasing acidic strength is

- (a) phenol < ethanol < chloroacetic acid < acetic acid  
(b) ethanol < phenol < chloroacetic acid < acetic acid  
(c) ethanol < phenol < acetic acid < chloroacetic acid  
(d) chloroacetic acid < acetic acid < phenol < ethanol

10. KF has ccp structure. How many  $\text{F}^-$  ions and octahedral voids are there in this unit cell respectively?

- (a) 4 and 4 (b) 4 and 8  
(c) 8 and 4 (d) 6 and 6

11. The osmotic pressure of blood is 8.21 atm at  $37^\circ\text{C}$ . How much glucose would be used for an injection that is at the same osmotic pressure as blood?

- (a) 22.17  $\text{g L}^{-1}$  (b) 58.14  $\text{g L}^{-1}$   
(c) 61.26  $\text{g L}^{-1}$  (d) 75.43  $\text{g L}^{-1}$

12. At equilibrium, the rate of dissolution of a solid solute in a volatile liquid solvent is

- (a) less than the rate of crystallisation  
(b) greater than the rate of crystallisation  
(c) equal to the rate of crystallisation  
(d) zero

13. A chelating agent has two or more than two donor atoms to bind a single metal ion. Which of the following is not a chelating agent?

- (a) Thiosulphate  
(b) Glycinate  
(c) Oxalate  
(d) Ethane-1, 2-diamine

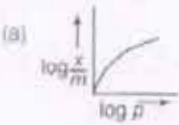
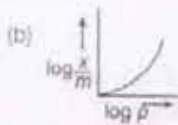
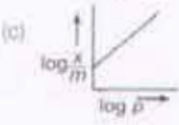
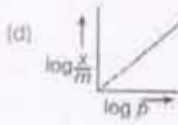
14. On addition of small amount of  $\text{KMnO}_4$  to conc.  $\text{H}_2\text{SO}_4$ , a green oily compound is obtained which is highly explosive in nature. Identify the compound from the following.

- (a)  $\text{Mn}_2\text{O}_7$   
(b)  $\text{MnO}_2$   
(c)  $\text{MnSO}_4$   
(d)  $\text{Mn}_2\text{O}_3$





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15. The magnetic nature of elements depends on the presence of unpaired electrons. Identify the configuration of transition element, which shows highest magnetic moment.
- (a)  $3d^1$  (b)  $3d^6$   
(c)  $3d^8$  (d)  $3d^2$
16. Which of the following elements can be involved in  $p\pi - d\pi$  bonding?
- (a) Carbon  
(b) Nitrogen  
(c) Phosphorus  
(d) Boron
17. On addition of conc.  $H_2SO_4$  to a chloride salt, colourless fumes are evolved but in case of iodide salt, violet fumes come out. This is because.
- (a)  $H_2SO_4$  reduces HI to  $I_2$   
(b) HI is of violet colour  
(c) HI gets oxidised to  $I_2$   
(d) HI changes to  $HIO_3$
18. Affinity for hydrogen decreases in the group from fluorine to iodine. Which of the halogen acids should have highest bond dissociation enthalpy?
- (a) HF (b) HCl  
(c) HBr (d) HI
19. Which of the following statement is not correct about an inert electrode in a cell?
- (a) It does not participate in the cell reaction.  
(b) It provides surface either for oxidation or for reduction reaction.  
(c) It provides surface for conduction of electrons.  
(d) It provides surface for redox reaction
20. Which of the following statement is correct?
- (a)  $E_{cell}$  and  $\Delta_r G$  of cell reaction both are extensive properties.  
(b)  $E_{cell}$  and  $\Delta_r G$  of cell reaction both are intensive properties.  
(c)  $E_{cell}$  is intensive property while  $\Delta_r G$  of cell reaction is an extensive property.  
(d)  $E_{cell}$  is an extensive property while  $\Delta_r G$  of cell reaction is an intensive property.
21. Which of the following curves is in accordance with Freundlich adsorption isotherm?
- (a)   
(b)   
(c)   
(d) 
22. A number of elements available in earth's crust but most abundant elements are
- (a) Al and Fe (b) Al and Cu  
(c) Fe and Cu (d) Cu and Ag
23. The element which forms oxides in all oxidation states +1 to +5 is
- (a) nitrogen (b) phosphorus  
(c) arsenic (d) antimony
24. Which of the following is the increasing order of enthalpy of vaporization?
- (a)  $NH_3, PH_3, AsH_3$  (b)  $AsH_3, PH_3, NH_3$   
(c)  $NH_3, AsH_3, PH_3$  (d)  $PH_3, AsH_3, NH_3$
25. When  $Be_2$  is treated with aqueous solutions of NaF, NaCl, NaI separately
- (a)  $F_2, Cl_2$  and  $I_2$  are liberated  
(b) only  $F_2$  and  $Cl_2$  are liberated  
(c) only  $I_2$  is liberated  
(d) only  $Cl_2$  is liberated
26. In the presence of a catalyst, the heat evolved or absorbed during the reaction
- (a) increases  
(b) decreases  
(c) remains unchanged  
(d) may increase or decrease
27. The rate of a gaseous reaction is given by the expression  $k[A][B]$ . If the volume of the reaction vessel is suddenly reduced to  $\frac{1}{4}$ th of the initial volume, the reaction rate relating to original rate will be
- (a)  $\frac{1}{10}$  (b)  $\frac{1}{8}$  (c) 8 (d) 16



28. Which of the following is 3<sup>o</sup> amine?  
(a) 1-methylcyclohexylamine  
(b) Triethyl amine  
(c) *Tert*-butylamine  
(d) *N*-methyl aniline
29. Which of the following enhances lathering property of soap?  
(a) Sodium carbonate  
(b) Sodium rosinate  
(c) Sodium stearate  
(d) Trisodium phosphate
30. The deficiency of vitamin C causes  
(a) scurvy  
(b) rickets  
(c) pyrochea  
(d) pernicious anaemia
31. Excess fluoride (over 10 ppm) in drinking water can cause  
(a) harmful effect of bones and teeth  
(b) methemoglobinemia  
(c) kidney damage  
(d) laxative effect
32. For the process to occur under adiabatic conditions, the correct condition is  
(a)  $\Delta T = 0$   
(b)  $\Delta p = 0$   
(c)  $q = 0$   
(d)  $W = 0$
33.  $\frac{3}{2} O_2(g) \longrightarrow O_3(g)$ ;  $K_p$  for this reaction is  $2.47 \times 10^{-29}$ . At 298K,  $\Delta_r G^\circ$  for conversion of oxygen to ozone will be  
(a) 100 kJ mol<sup>-1</sup>  
(b) 150 kJ mol<sup>-1</sup>  
(c) 163 kJ mol<sup>-1</sup>  
(d) 2303 kJ mol<sup>-1</sup>
34. Which one of the following statements about C<sub>2</sub> molecule is wrong?  
(a) The bond order of C<sub>2</sub> is 2.  
(b) In vapour phase, C<sub>2</sub> molecule is diamagnetic.  
(c) Double bond in C<sub>2</sub> molecule consists of both  $\pi$ -bonds because of the presence of 4 e<sup>-</sup> in two  $\pi$ -molecular orbitals.  
(d) double bond in C<sub>2</sub> molecule consists of one  $\sigma$ -bond and one  $\pi$ -bond.
35. The type of hybridisation in SF<sub>6</sub> molecule is  
(a) sp<sup>2</sup>d  
(b) sp<sup>3</sup>  
(c) sp<sup>3</sup>d<sup>2</sup>  
(d) d<sup>2</sup>sp<sup>3</sup>
36. Among LiCl, BeCl<sub>2</sub>, BCl<sub>3</sub> and CCl<sub>4</sub>, the covalent bond character follows the order  
(a) LiCl < BeCl<sub>2</sub> < BCl<sub>3</sub> < CCl<sub>4</sub>  
(b) BCl<sub>3</sub> < CCl<sub>4</sub> < BeCl<sub>2</sub> < LiCl  
(c) BeCl<sub>2</sub> < LiCl < CCl<sub>4</sub> < BCl<sub>3</sub>  
(d) CCl<sub>4</sub> < BCl<sub>3</sub> < BeCl<sub>2</sub> < LiCl
37. Maximum number of electrons in a subshell of an atom determined by the following?  
(a) 4l + 2  
(b) 2l<sup>2</sup>  
(c) 4l - 2  
(d) 2l + 1
38. The average kinetic energy of an ideal gas per molecule in SI units at 25°C will be  
(a)  $6.17 \times 10^{-21}$  JK<sup>-1</sup>  
(b)  $6.17 \times 10^{-21}$  kJJK<sup>-1</sup>  
(c)  $6.17 \times 10^{-20}$  JK<sup>-1</sup>  
(d)  $7.16 \times 10^{-20}$  JK<sup>-1</sup>
39. pK<sub>a</sub> of acetic acid and pK<sub>b</sub> of ammonium hydroxide are 4.76 and 4.75 respectively. Calculate the pH of ammonium acetate solution.  
(a) 6.02  
(b) 7.005  
(c) 8  
(d) 5.602
40. The value of K<sub>c</sub> for the reaction,  $2A \rightleftharpoons B + C$  is  $2 \times 10^{-3}$ . At a given time, if the composition of reaction mixture is [A] = [B] = [C] =  $3 \times 10^{-3}$  M. Which is true?  
(a) The reaction will proceed in forward direction  
(b) The reaction will proceed in backward direction  
(c) The reaction will proceed in any direction  
(d) None of the above

## Zoology

1. Pellagra is caused by deficiency of vitamins  
(a) B<sub>1</sub>  
(b) B<sub>2</sub>  
(c) B<sub>6</sub>  
(d) B<sub>12</sub>
2. Notochord originates from  
(a) mesoderm  
(b) ectoderm  
(c) endoderm  
(d) None of these
3. Parthenogenesis is a term of  
(a) budding  
(b) asexual reproduction  
(c) sexual reproduction  
(d) regeneration.
4. Bartholin's gland is found in  
(a) penis  
(b) stomach  
(c) liver  
(d) vagina







13. Which of the following organelles does not contain RNA?

- (a) Plasmalemma (b) Ribosome  
(c) Chromosome (d) Nucleolus

14. Dutrochet has given the concept about cell in

- (a) 1834 (b) 1814 (c) 1822 (d) 1824

15. The scientific name of gharial is

- (a) *Naja bungarus*  
(b) *Gavialis gangeticus*  
(c) *Hemidactylus flaviviridis*  
(d) None of the above

16. Which of the given option is correct regarding the statements?

**Statement I** Cephalochordata bears notochord all along the body throughout life.

**Statements II** Urochordate bears vertebral column only in tail region throughout the life.

- (a) I wrong, II correct (b) I correct, II wrong  
(c) Both I and II are wrong (d) Both are correct

17. In which of the following haemocyanin pigment is found?

- (a) Lower invertebrates (b) Echinodermata  
(c) Insecta (d) Annelida

18. Which of the following cells in earthworm play a role similar to liver in vertebrates?

- (a) Amoebocytes (b) Mucocytes  
(c) Chloragogen cells (d) Epidermal cells

19. Match the following and select the correct option.

List I	List II
A. Cyclostomes	1. Hemichordata
B. Aves	2. Urochordata
C. Tunicates	3. Agantha
D. <i>Balanoglossus</i>	4. Pisces
E. <i>Osteichthyes</i>	5. Tetrapod

Codes

- A B C D E  
(a) 3 5 2 1 4  
(b) 3 1 5 2 4  
(c) 1 2 3 4 5  
(d) 2 3 4 1 5

20. Chondrichthyes is characterised by

- (a) placoid scale  
(b) placoid scale and ventral mouth  
(c) ventral mouth  
(d) ctenoid scale and ventral mouth

21. Ichthyology is study of

- (a) aves (b) amphibians  
(c) reptiles (d) fishes

22. What will happen if ligaments are torn?

- (a) Bone will become unfixed  
(b) Bone will become fixed  
(c) Bone less movable at joint and pain  
(d) Bone will move freely at joint and no pain

23. Achondroplasia is a disease related with the defect in the formation of

- (a) membrane (b) mucosa  
(c) bone (d) cartilage

24. Yellow bone marrow is found specially in the medullary cavity

- (a) long bones  
(b) spongy bones  
(c) short bones  
(d) All of the above

25. Match the items of column I with column II and choose the correct option from the codes given below.

Column I	Column II
A. Neuron	1. Ossein
B. Bone-matrix	2. Nissl's bodies
C. RBCs of man	3. Antibodies
D. Lymphocytes	4. Non-nucleated

Codes

- A B C D  
(a) 4 1 2 3  
(b) 2 1 4 3  
(c) 3 4 1 2  
(d) 2 3 4 1

26. Space in the jaw bone unoccupied by teeth is called

- (a) dentine  
(b) diastema  
(c) enamel  
(d) crown



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27. Identify the correct set, which shows the name of the enzyme from where it is secreted and substrate upon which it acts.
- (a) Ptyalin – Intestine – Maltose  
(b) Ptyalin – Pancreas – Lipid  
(c) Pepsin – Stomach wall – Casein  
(d) Chymotrypsin – Salivary gland – Lactose
28. Endemic goitre is a state of
- (a) normal thyroid function  
(b) moderate thyroid function  
(c) increased thyroid function  
(d) decreased thyroid function
29. Hormone responsible for the secretion of milk after parturition is
- (a) ACTH (b) LH (c) ICSH (d) Prolactin
30. What is another name for the wind pipe?
- (a) Trachea (b) Larynx  
(c) Oesophagus (d) Lungs
31. Soil salinity is measured by
- (a) Porometer (b) Calorimeter  
(c) Conductivity meter (d) Potometer
32. Predation and parasitism are which type of interactions.
- (a) (+, +) (b) (+, 0) (c) (-, -) (d) (+, -)
33. The ultimate source of energy for living being is
- (a) sunlight (b) ATP  
(c) fats (d) carbohydrates
34. Which of the following species are restricted to an area?
- (a) Sympatric species (b) Sibling species  
(c) Allopatric species (d) Endemic species
35. Select the incorrect statement.
- (a) Stellar's sea cow and passenger pigeon got extinct due to over exploitation by men  
(b) The mitotic convention on biological diversity was held in 1992  
(c) Species diversity increase as we move away from the equator towards the poles  
(d) *Lantana* and *Eichhornia* are invasive weed species in India
36. The effect of cigarette smoking and radon in combination on lungs is
- (a) fatal  
(b) synergistic  
(c) mutualistic  
(d) antagonistic
37. The thermostable enzymes, *Taq* and *Pfu*, isolated from thermophilic bacteria are
- (a) RNA polymerases  
(b) DNA ligases  
(c) DNA polymerases  
(d) restriction endonucleases
38. Biolistic technique is used in
- (a) gene transfer process  
(b) tissue culture process  
(c) hybridisation process  
(d) germplasm conservation process
39. The largest gene in man is
- (a) insulin gene  
(b) tumour suppressor gene  
(c) beta globin gene of haemoglobin  
(d) dystrophin
40. Herbicide resistant gene in plant is
- (a) *Mt* (b) *Gt*  
(c) *Ct* (d) *Bt*

## Botany

1. In photosynthesis carbon dioxide is converted to carbohydrates. It is a ..... process.
- (a) reductive  
(b) oxidative  
(c) catabolic and exergonic  
(d) None of the above
2. Which of the following is not an auxin?
- (a) IAA (b) IBA (c) Zeatin (d) NAA
3. Which of the following properties is shown by cytokinins?
- (a) Delay leaf senescence  
(b) Cause leaf abscission  
(c) Promote seed dormancy  
(d) Promote stomatal closing





4. Which of the following characteristics is are exhibited by  $C_4$ -plants?

- I. Kranz anatomy.
- II. The first product of photosynthesis is oxaloacetic acid.
- III. Both PEP carboxylates and ribulose biphosphate carboxylate act as carboxylating enzymes.

The correct option is

- (a) I and III, but not II
  - (b) I and II, but not III
  - (c) II and III, but not I
  - (d) II and III
5. Which of the following plant keeps its stomata open during night and closed during the day?
- (a) Orchid
  - (b) Cactus
  - (c) Tea
  - (d) Wheat

6. Genetic dwarfism can be overcome by

- (a) gibberellin
- (b) ethylene
- (c) auxin
- (d) ABA

7. Hormone inducing fruit ripening is

- (a) cytokinin
- (b) ethylene
- (c) abscisic acid
- (d) gibberellic acid

8. The year 1900 AD is highly significant for geneticists due to

- (a) discovery of genes
- (b) principle of linkage
- (c) chromosome theory of heredity
- (d) rediscovery of Mendelism

9.  $F_1$ -generation means

- (a) first filial generation
- (b) first seed generation
- (c) first flowering generation
- (d) first fertile generation

10. Skin colour is controlled by

- (a) single gene
- (b) 3 pairs of genes
- (c) 2 pairs of genes
- (d) 2 pairs of genes with an intragene

11. Which of the following cross will produce terminal flower in garden pea?

- (a)  $AA \times Aa$
- (b)  $AA \times aa$
- (c)  $Aa \times Aa$
- (d)  $Aa \times AA$

12. Which one of the following pairs of plants are not seed producers?

- (a) *Funaria* and *Ficus*
- (b) Fern and *Funaria*
- (c) *Funaria* and *Pinus*
- (d) *Ficus* and *Chlamydomonas*

13. Which one of the following is heterosporous?

- (a) *Equisetum*
- (b) *Dryopteris*
- (c) *Salvinia*
- (d) *Adiantum*

14. *Cycas revoluta* is popularly known as

- (a) sago palm
- (b) royal palm
- (c) date palm
- (d) sea palm

15. Match the following with correct combination.

Column I	Column II
A. <i>Cuscuta</i>	1. Saprophyte
B. <i>Eichhornia</i>	2. Pneumatophore
C. <i>Monotropa</i>	3. Insectivorous plant
D. <i>Rhizophora</i>	4. Parasite
E. <i>Utricularia</i>	5. Root pocket

Codes

- |     | A | B | C | D | E |
|-----|---|---|---|---|---|
| (a) | 3 | 1 | 5 | 4 | 2 |
| (b) | 2 | 3 | 1 | 5 | 4 |
| (c) | 4 | 3 | 1 | 5 | 2 |
| (d) | 4 | 5 | 1 | 2 | 3 |

16. Bacterial endotoxin is

- (a) a toxic protein that stays inside the bacterial cell
- (b) a toxic protein that is excreted into the medium
- (c) lipopolysaccharide located on the surface of the bacteria
- (d) None of the above

17. Endosperm of gymnosperms is

- (a) haploid
- (b) tetraploid
- (c) diploid
- (d) None of these

18. First vascular plant is

- (a) thallophyta
- (b) pteridophyta
- (c) bryophyta
- (d) spermatophyta



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19. Diatomaceous earth is obtained from  
(a) Bacillariophyceae (b) Xanthophyceae  
(c) Rhodophyceae (d) Chrysophyceae
20. Which of the following is an epidermal cell containing chloroplast?  
(a) Stomata (b) Hydathode  
(c) Guard cell (d) None of these
21. The structures present in the roots to absorb water and minerals is  
(a) epidermal extensions  
(b) hypodermis  
(c) endodermis  
(d) epidermal appendages
22. Lady finger belongs to family  
(a) Malvaceae (b) Cucurbitaceae  
(c) Brassicaceae (d) Liliaceae
23. The interxylary phloem is found in the stem of  
(a) *Cucurbita* (b) *Salvia*  
(c) *Calotropis* (d) None of these
24. Wound healing is due to  
(a) ventral meristem (b) secondary meristem  
(c) primary meristem (d) All of these
25. Angular collenchyma occurs in  
(a) *Salvia* (b) *Helianthus*  
(c) *Athraea* (d) *Cucurbita*
26. In pteridophytes, phloem is without  
(a) bast fibers (b) sieve tubes  
(c) companion cells (d) sieve cells
27. Match the following entities of column I with their respective orders of column II and choose the correct combination form the option.

Column I	Column II
A. Wheat	1. Primate
B. Mango	2. Diptera
C. Housefly	3. Sapindales
D. Man	4. Poales

Codes

- |     | A | B | C | D |
|-----|---|---|---|---|
| (a) | 4 | 3 | 2 | 1 |
| (b) | 1 | 2 | 4 | 3 |
| (c) | 3 | 4 | 2 | 1 |
| (d) | 2 | 4 | 1 | 3 |

28. Agar-agar is produced by  
(a) fungi (b) algae  
(c) bacteria (d) blue-green algae
29. In DNA, when AGCT occurs, their association is as per which of the following pair  
(a) A-G, C-T (b) A-T, G-C  
(c) A-C, G-T, A-C, E-T (d) All of these
30. A segment of DNA has 120 adenine and 120 cytosine bases. The total number of nucleotides present in the segment is  
(a) 60 (b) 240 (c) 120 (d) 480
31. Lactose is composed of  
(a) glucose + glucose (b) glucose + galactose  
(c) glucose + fructose (d) fructose + galactose
32. Meiosis is best observed in dividing  
(a) cell of lateral meristem  
(b) cells of apical meristem  
(c) microsporocytes  
(d) microspores and anther wall
33. Study the following statements and select the correct option.  
I. Tapetum nourishes the developing pollen grains.  
II. Hilum represents the junction between ovule and funicle.  
III. In aquatic plants such as water hyacinth and water lily, pollination is by water.  
IV. The primary endosperm nucleus is triploid.  
(a) I, II, and IV are correct, but III is incorrect  
(b) I and II are correct, but III and IV are incorrect  
(c) I and IV are correct, but II and III are incorrect  
(d) I, III and IV are correct, but I is incorrect
34. Masses of pollen grains, i.e., pollinia is found in  
(a) Gramineae (b) Solanaceae  
(c) Orchidaceae (d) Malvaceae
35. Morphine, which is used as an analgesic is obtained from  
(a) *Taxus brevifolia*  
(b) *Berberis nighieriensis*  
(c) *Cinchona officinalis*  
(d) *Papaver somniferum*



36. Pebrine is a disease of  
(a) fish  
(b) honey bee  
(c) silk worm  
(d) lac insect
37. Factor governing the earth surface is  
(a) topographic  
(b) edaphic  
(c) temperature  
(d) biotic
38. The direction of energy flow is  
(a) Producers → Herbivores → Decomposers → Omnivores  
(b) Producers → Carnivore → Herbivores → Decomposers  
(c) Decomposers → Carnivores → Herbivores → Producers  
(d) Producers → Herbivores → Carnivores → Decomposers
39. If the Bengal tiger become extinct  
(a) hyenas and wolves will become scarce  
(b) its gene pool will be lost forever  
(c) the wild areas will be safe for man and domestic  
(d) the population of beautiful animals like deers will get stabilised
40. Biological treatment of water pollution is done with the help of  
(a) fungi  
(b) lichen  
(c) phytoplanktons  
(d) None of the above

## English

**Directions** (Q. Nos. 1-5) *In the following questions, sentences are given with blanks to be filled in with an appropriate word. Four alternatives are suggested for each question. Choose the correct alternative out of the four.*

1. The little girl.....for the light switch in the dark.  
(a) groped (b) grappled  
(c) gripped (d) grovelled
2. The summit meeting provided him the much.....shot in the arm.  
(a) required (b) desired  
(c) needed (d) urgent
3. We must.....the tickets for the movie in advance.  
(a) draw (b) buy  
(c) remove (d) take
4. The State Transport Corporation has.....a loss of ₹ 5 crore this year.  
(a) obtained (b) derived  
(c) incurred (d) formulated
5. One..... and you know who among them is the culprit.  
(a) look (b) peep  
(c) sight (d) gaze

**Directions** (Q. Nos. 6-10) *In the following questions, out of the four alternatives, choose the one which best expresses the meaning of the given word.*

6. GAINSAY  
(a) Advantage (b) Proposal  
(c) Contradict (d) Suggestion
7. PROFOUND  
(a) Profuse (b) Boundless  
(c) Deep (d) Fathomless
8. FLAK  
(a) Adventure (b) Advice  
(c) Criticism (d) Praise
9. HOODLUM  
(a) Pioneer (b) Criminal  
(c) Devotee (d) Scholar
10. SPASMODIC  
(a) Continuous (b) Gradual  
(c) Intermittent (d) Spontaneous

**Directions** (Q. Nos. 11-15) *In the following questions, choose the word opposite in meaning to the given word.*

11. FILTHY  
(a) Stainless (b) Shining  
(c) Sterilised (d) Clean





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12. CROWDED

- (a) Deserted (b) Lonely  
(c) Empty (d) Barren

13. VAGUE

- (a) Known (b) Published  
(c) Popular (d) Definite

14. SUPERVISE

- (a) Overlook (b) Misdirect  
(c) Neglect (d) Forget

15. MAGNANIMOUS

- (a) Selfish (b) Naive  
(c) Generous (d) Small

**Directions** (Q. Nos. 16-20) *In the following questions, four alternatives are given for the idiom/phrase printed in bold in the sentence. Choose the alternative which best expresses the meaning of the idiom/phrase.*

16. We have to **keep our fingers crossed** till the final result is declared.  
(a) keep praying  
(b) feel suspicious  
(c) wait expectantly  
(d) feel scared
17. The members of the group were at **odds** over the selection procedure.  
(a) acting foolishly (b) in dispute  
(c) unanimous (d) behaving childishly
18. The popularity of the yesteryears' superstar is **on the wane**.  
(a) growing more (b) at its peak  
(c) growing less (d) at rock-bottom
19. His father advised him to be **fair and square** in his dealings lest he should fall into trouble.  
(a) considerate (b) upright  
(c) careful (d) polite
20. There is **no love lost** between the two neighbours.  
(a) close friendship  
(b) intense dislike  
(c) a love-hate relationship  
(d) cool indifference

**Directions** (Q. Nos. 21-25) *In the following questions, a part of the sentence is printed in bold. Below are given alternatives to the bold part at (a), (b), (c) which may improve the sentence. Choose the correct alternative. In case no improvement is needed, your answer is (d).*

21. Ravi has got many friends because he has got **much money**.  
(a) Enough money (b) A lot of money  
(c) Bags of money (d) No improvement
22. You must try **making him to understand**.  
(a) Make him understand  
(b) To making him understand  
(c) To make him understand  
(d) No improvement
23. He has cooked that meal so often he can do it with his **eyes closed**.  
(a) Mind blank (b) Eyes covered  
(c) Hands full (d) No improvement
24. Not a word **they spoke** to the unfortunate wife about it.  
(a) They had spoken (b) Did they speak  
(c) They will speak (d) No improvement
25. There is sufficient fund to meet the requirement of **the entire schools** in our zone.  
(a) Schools (b) All the schools  
(c) All of the schools (d) No improvement

**Directions** (Q. Nos. 26-30) *In the following questions, out of the four alternatives, choose the one which can be substituted for the given words/sentence.*

26. Word for word reproduction.  
(a) Copying (b) Mugging  
(c) Verbatim (d) Photostat
27. A person who collects coins.  
(a) Philatelist (b) Numismatist  
(c) Narcissist (d) Fatalist
28. That which is perceptible by touch  
(a) Tangible (b) Tenacious  
(c) Contagious (d) Contingent
29. One who possesses many talents.  
(a) Versatile (b) Gifted  
(c) Exceptional (d) Nubile



30. A person who studies the formation of the Earth.

- (a) Meteorologist
- (b) Anthropologist
- (c) Geologist
- (d) Seismologist

**Directions** (Q. Nos. 31-35) *In the following questions, the first and the last parts of the sentence are numbered 1 and 6. The rest of the sentence is split into four parts named P, Q, R and S. These parts are not given in their proper order. Rearrange these parts in their proper order and find out which of the given four combination is correct?*

31. (1) In reply to a question

- (P) that securing extradition
  - (Q) operating from the UK soil remained
  - (R) of anti-India elements
  - (S) the spokesman said
  - (6) New Delhi's first priority.
- (a) PRQS
  - (b) QSPR
  - (c) RQSP
  - (d) SPRO

32. (1) The first component is

- (P) and vocational training
  - (Q) so as to enable them
  - (R) the provision of further technical
  - (S) to both rural and urban youth
  - (6) to secure employment in industry and the services sector.
- (a) PRSQ
  - (b) RPSQ
  - (c) RSQP
  - (d) SRPQ

33. (1) The move to revert to a six-day week

- (P) among the employees
  - (Q) while the leaders represented to the Chief Minister
  - (R) that they be taken into confidence
  - (S) led to an animated decision
  - (6) before any decision was taken.
- (a) QPSR
  - (b) RSPQ
  - (c) SPQR
  - (d) SQPR

34. (1) It was obvious

- (P) made by him
  - (Q) submitted at the meeting
  - (R) from the comments
  - (S) on the draft proposals
  - (6) that he was not satisfied with them.
- (a) PSRQ
  - (b) QRSP
  - (c) RPSQ
  - (d) SQRP

35. (1) The Minister of state for power

- (P) laying emphasis
  - (Q) in conservation of electricity in industries
  - (R) has written to his counterparts in State Government
  - (S) on bringing about improvement
  - (6) by introduction of energy efficient equipment.
- (a) QPSR
  - (b) RPSQ
  - (c) SPQR
  - (d) SQPR

**Directions** (Q. Nos. 36-40) *Read the following passage carefully and answer the questions given below it.*

In this work of incessant and feverish activity, men have little time to think, much less to consider ideals and objectives. Yet how are we to act, even in the present, unless we know which way we are going and what our objectives are? It is only in the peaceful atmosphere of a university that these basic problems can be adequately considered.

It is only when the young men and women, who are in the university today and on whom the burden of life's problems will fall tomorrow, learn to have clear objectives and standards of values that there is hope for the next generation. The past generation produced some great men but as a generation it led the world repeatedly to disaster. World Wars I and II are the price that has been paid for the lack of wisdom on man's part in this generation.



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I think that there is always a close and intimate relationship between the end we aim at and the means adopted to attain it.

Even, if the end is right, but the means are wrong, it will vitiate the end or divert us in a wrong direction. Means and ends are thus intimately and inextricably connected and cannot be separated.

That indeed has been the lesson of old taught us by many great men in the past, but unfortunately it seldom remembered.

- 36.** People have little time to consider ideals and objectives because
- (a) they consider these ideals meaningless
  - (b) they do not want to burden themselves with such ideas
  - (c) they have no inclination for such things
  - (d) they are excessively engaged in their routine activities
- 37.** 'The burden of life's problems' in the fourth sentence refers to
- (a) the incessant and feverish activities
  - (b) the burden of family responsibilities
  - (c) the onerous duties of life
  - (d) the sorrows and sufferings
- 38.** The World Wars I and II are the price that man paid due to
- (a) the absence of wisdom and sagacity
  - (b) his not caring to consider the life's problems
  - (c) his ignoring the ideals and objectives of life
  - (d) his excessive involvement in feverish activities
- 39.** According to the writer the adoption of wrong means even for the right end would
- (a) not let us attain our goal
  - (b) bring us dishonour
  - (c) impede our progress
  - (d) deflect us from the right path
- 40.** The word 'vitate' used in the second paragraph means
- (a) negate (b) debase (c) tarnish (d) destroy





## Answers

### Physics

- |         |         |         |         |         |         |         |         |         |         |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 1. (a)  | 2. (b)  | 3. (a)  | 4. (c)  | 5. (b)  | 6. (a)  | 7. (b)  | 8. (c)  | 9. (c)  | 10. (b) |
| 11. (c) | 12. (a) | 13. (a) | 14. (a) | 15. (b) | 16. (a) | 17. (c) | 18. (a) | 19. (c) | 20. (c) |
| 21. (b) | 22. (c) | 23. (c) | 24. (b) | 25. (a) | 26. (d) | 27. (c) | 28. (c) | 29. (c) | 30. (a) |
| 31. (d) | 32. (d) | 33. (c) | 34. (c) | 35. (c) | 36. (b) | 37. (d) | 38. (d) | 39. (d) | 40. (c) |

### Chemistry

- |         |         |         |         |         |         |         |         |         |         |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 1. (c)  | 2. (a)  | 3. (a)  | 4. (a)  | 5. (c)  | 6. (b)  | 7. (a)  | 8. (b)  | 9. (c)  | 10. (a) |
| 11. (b) | 12. (c) | 13. (a) | 14. (a) | 15. (b) | 16. (c) | 17. (c) | 18. (a) | 19. (d) | 20. (c) |
| 21. (c) | 22. (a) | 23. (a) | 24. (d) | 25. (c) | 26. (c) | 27. (d) | 28. (b) | 29. (b) | 30. (a) |
| 31. (a) | 32. (c) | 33. (c) | 34. (d) | 35. (c) | 36. (a) | 37. (a) | 38. (a) | 39. (b) | 40. (d) |

### Zoology

- |         |         |         |         |         |         |         |         |         |         |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 1. (a)  | 2. (a)  | 3. (c)  | 4. (d)  | 5. (b)  | 6. (a)  | 7. (a)  | 8. (d)  | 9. (b)  | 10. (c) |
| 11. (b) | 12. (b) | 13. (a) | 14. (d) | 15. (b) | 16. (b) | 17. (a) | 18. (c) | 19. (a) | 20. (b) |
| 21. (d) | 22. (c) | 23. (d) | 24. (a) | 25. (b) | 26. (b) | 27. (c) | 28. (d) | 29. (d) | 30. (a) |
| 31. (c) | 32. (d) | 33. (a) | 34. (d) | 35. (c) | 36. (b) | 37. (c) | 38. (a) | 39. (d) | 40. (d) |

### Botany

- |         |         |         |         |         |         |         |         |         |         |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 1. (d)  | 2. (c)  | 3. (a)  | 4. (d)  | 5. (b)  | 6. (a)  | 7. (b)  | 8. (d)  | 9. (a)  | 10. (b) |
| 11. (c) | 12. (b) | 13. (c) | 14. (a) | 15. (d) | 16. (c) | 17. (a) | 18. (b) | 19. (a) | 20. (c) |
| 21. (a) | 22. (a) | 23. (c) | 24. (b) | 25. (d) | 26. (c) | 27. (a) | 28. (b) | 29. (b) | 30. (d) |
| 31. (b) | 32. (c) | 33. (a) | 34. (c) | 35. (d) | 36. (c) | 37. (a) | 38. (d) | 39. (b) | 40. (c) |

### English

- |         |         |         |         |         |         |         |         |         |         |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 1. (a)  | 2. (c)  | 3. (b)  | 4. (c)  | 5. (a)  | 6. (c)  | 7. (c)  | 8. (c)  | 9. (b)  | 10. (c) |
| 11. (d) | 12. (a) | 13. (d) | 14. (b) | 15. (a) | 16. (c) | 17. (b) | 18. (c) | 19. (b) | 20. (b) |
| 21. (b) | 22. (c) | 23. (d) | 24. (b) | 25. (b) | 26. (c) | 27. (b) | 28. (a) | 29. (a) | 30. (c) |
| 31. (d) | 32. (b) | 33. (c) | 34. (c) | 35. (b) | 36. (d) | 37. (c) | 38. (a) | 39. (d) | 40. (b) |

## Hints & Solutions

### Physics

- The maximum velocity  $v_{\text{max}} = \sqrt{\mu rg}$   
 $= \sqrt{1.28 \times 40 \times 9.8}$   
 $= 22.4 \text{ m/s}$
- The escape velocity of the planet  
$$v_{\text{escape}} = \sqrt{\frac{2Gm}{R}} \propto \sqrt{\frac{M}{R}}$$
  
$$\therefore \frac{v_p}{v_e} = \sqrt{\frac{M_p \times R_e}{R_p \times M_e}}$$
  
or  $\frac{v_p}{v_e} = \sqrt{100 \times \frac{1}{4}} = 5$   
 $v_p = 5 \times 11.2 = 56 \text{ km/s}$
- Light travels faster in air than that in glass. This is accordance with wave theory of light.
- Due to the specific shape of wings when the aeroplane runs air passes at higher speed over it as compared to its lower surface. This difference of air speeds above and below the wings, in accordance with Bernoulli's principle, creates a pressure difference, due to which an upward force called called dynamic lift act son the plate.  
Upward lift = pressure difference  $\times$  area of wing  
$$= \frac{1}{2} \rho A (v_1^2 - v_2^2)$$

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5. The time of flight =  $\frac{2v \sin \theta}{g}$   
 $= \frac{2 \times 9.8 \times \sin 30^\circ}{9.8} = 1 \text{ s}$

6.  $\alpha$ -particles are emitted =  $\frac{238 - 222}{4} = 4$

The atomic number is decreased  
 $90 - 4 \times 2 = 82$

As atomic number of  ${}_{83}^{222}\text{Y}$ . So, atomic number is increased by 1, therefore, one  $\beta$ -particle is emitted.

7. From the relation

$$\Delta E = 13.6 \text{ eV} - \frac{13.6 \text{ eV}}{n^2}$$

$$= 13.6 \text{ eV} - \frac{13.6 \text{ eV}}{(2)^2} = 10.2 \text{ eV}$$

Therefore, excitation potential

$$= \frac{10.2}{e} \text{ eV} = 10.2 \text{ V}$$

8. From the formula of work done

$$W = p \Delta V = 10^5 \times 0.25 = 250 \text{ J}$$

9. Work done = Area increased

$\times$  surface tension

So, surface tension

$$S_f = \frac{3 \times 10^{-4}}{2 \times (10 \times 11 - 10 \times 6) \times 10^{-4}}$$

$$= 3 \times 10^{-3} \text{ N/m}$$

10. From the formula

$$C = \frac{\epsilon_0 A}{\frac{1}{k_1} + \frac{1}{k_2}} = \frac{\epsilon_0 A}{l} \left( \frac{k_1 k_2}{k_1 + k_2} \right)$$

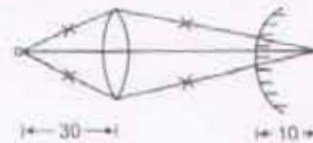
$$= \frac{2 \epsilon_0 A}{d} \left( \frac{k_1 k_2}{k_1 + k_2} \right)$$

11. Using the formula

$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$$

$$\frac{1}{v} - \frac{1}{-30} = \frac{1}{20}$$

$$v = 60 \text{ cm}$$



If the image is formed at the centre of curvature of the mirror, the coincidence is possible. Then the rays refracting through the lens will fall normally on the convex mirror and retrace their path of form the image at  $O$ . Hence, the distance between lens and mirror will be  $60 - 10 = 50 \text{ cm}$ .

12. We know that for obtaining maximum power, the internal resistance must be equal to variable resistance so, the value of  $R$  will be  $0.5 \Omega$ .

13. Given,  $\frac{R}{C_V} = 0.67$

$$\text{So, } C_V = \frac{R}{0.67} = 1.5 R = \frac{3}{2} R$$

This value corresponds to monoatomic.

14. Given,  $\sin i = \frac{1}{\mu} = \frac{3}{5}$

$$\text{So, } \tan i = \frac{3}{4} = \frac{r}{4}$$

It gives  $r = 3 \text{ m}$

So, the diameter =  $6 \text{ m}$ .

15. Applying law of conservation of momentum

$$m \times 3 = (m + 2m) v_1$$

So,  $v_1 = 1 \text{ km/h}$

16. Comparing the given equation of the standard equation of wave

$$w y_0 = 2v$$

$$2\pi n y_0 = 2n \lambda$$

$$\lambda = \pi y_0$$

17. From the relation

$$E_3 - E_2 = (-1.5) - (-13.6) = 12.1$$

As the energy is equal to the energy taken by  $n = 1, n = 2, n = 3$ . Hence there will be three spectral line.



18. Rate of energy  $\frac{H}{t} = I^2 R$

(But total Resistance  $R = 21 + 4 = 25 \Omega$ )

So,  $\frac{H}{t} = 0.2 \times 0.2 \times 25 = 1 \text{ J/s}$

19. We know that binding energy per nucleon increases with atomic number binding energy for iron is maximum, after that it decreases.

20. From the formula, rotational KE

$$E_{\text{rotational}} = \frac{1}{2} I \omega^2 = \frac{L^2}{2I} \quad (\because L = I\omega)$$

Therefore,  $L^2 = 2EI$

Hence  $L_A^2 = 2E_A I_A \quad \dots (i)$

and  $L_B^2 = 2E_B I_B \quad \dots (ii)$

From Eq. (i) and (ii)

$$\frac{I_A}{I_B} = \sqrt{\frac{2E_A I_B}{2E_B I_A}} = \sqrt{\frac{100}{4}} = 5$$

$$\left( \because \frac{E_B}{E_A} = 100 \text{ and } \frac{I_A}{I_B} = 4 \right)$$

21. The principle of working of ball pen corresponds to surface tension.

22. As it is clear that the phase difference between  $\cos \theta$  and  $\sin \theta$  representing two simple harmonic motion is  $90^\circ$ .

23. Time period of simple pendulum

$$\begin{aligned} \text{For 1st pendulum } T_1 &= 2\pi \sqrt{\frac{5}{g}} \\ &= 2\pi \sqrt{\frac{5}{9.8}} = \sqrt{20} \text{ s} \end{aligned}$$

$$\begin{aligned} \text{For 2nd pendulum } T_2 &= 2\pi \sqrt{\frac{20}{g}} \\ &= 2\pi \sqrt{\frac{20}{9.8}} = 2\sqrt{20} \text{ s} \end{aligned}$$

Suppose the time will be in same phase is  $t$  then

$$\begin{aligned} \frac{t}{T_1} &= \frac{t}{T_2} - \frac{1}{T_2} \\ &= \frac{1}{\sqrt{20}} - \frac{1}{2\sqrt{20}} \end{aligned}$$

$$= \frac{1}{2\sqrt{20}}$$

So,  $t = 2\sqrt{20}$

Hence, the number of oscillation of simple pendulum of shorter length ( $x$ ) =  $\frac{2\sqrt{20}}{\sqrt{20}} = 2$ .

24. Using gas equation law

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$

$$\text{or } \frac{1 \times 500}{300} = \frac{0.5 \times V_2}{270}$$

$$V_2 = 900 \text{ m}^3$$

25. From the formula

$$I = \frac{V}{\sqrt{R^2 + (\omega L)^2}}$$

$$\begin{aligned} I &= \frac{220}{\sqrt{(20)^2 + (2\pi \times 50 \times 0.2)^2}} \\ &= \frac{220}{65} = 3.33 \text{ A} \end{aligned}$$

26. Induced emf

$$\begin{aligned} |e| &= L \frac{di}{dt} = (60 \times 10^{-3}) \times \frac{(3.0 - 2.0)}{0.2} \\ &= \frac{60 \times 10^{-3} \times 1}{0.2} = 0.3 \text{ V} \end{aligned}$$

Induced current,

$$I = \frac{e}{R} = \frac{0.3}{3} = 0.1 \text{ A}$$

27. Given  $l_1 = 1, l_2 = 4l$

$$\begin{aligned} l_{\text{max}} &= (\sqrt{l_1} + \sqrt{l_2})^2 \\ &= (\sqrt{1} + \sqrt{4l})^2 = (3\sqrt{l})^2 \\ &= 9l \end{aligned}$$

$$\begin{aligned} \text{and } l_{\text{min}} &= (\sqrt{l_1} - \sqrt{l_2})^2 = (\sqrt{l} - \sqrt{4l})^2 \\ &= (+\sqrt{l})^2 = l \end{aligned}$$

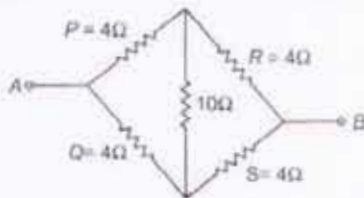
28. Voltmeter has high resistance and is always connected in parallel with the circuit. So to convert a galvanometer into voltmeter, a high resistance must be connected in series with it so that it draws negligible current from the circuit.





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29. The equivalent circuit can be redrawn as



We have,  $\frac{P}{Q} = \frac{R}{S}$

i.e.,  $\frac{4}{4} = \frac{4}{4}$

So, the given circuit is a balanced Wheatstone's bridge.

Hence, the equivalent resistance

$$R_{AB} = \frac{(4+4) \times (4+4)}{(4+4) + (4+4)} = \frac{8 \times 8}{8+8}$$

$$= \frac{64}{16} = 4 \Omega$$

30. According to Wien's displacement law,

$$\lambda_m T = \text{constant}$$

or  $\frac{\lambda_2}{\lambda_1} = \frac{T_1}{T_2}$

$\therefore \frac{\lambda_2}{\lambda} = \frac{2000}{3000} = \frac{2}{3}$

or  $\lambda_2 = \frac{2}{3} \lambda$

31. Drift velocity in a copper conductor

$$v_d = \frac{I}{neA} = \frac{5.4}{8.4 \times 10^{28} \times 1.6 \times 10^{-19} \times 10^{-6}}$$

$$= 0.4 \times 10^{-3} \text{ ms}^{-1}$$

$$= 0.4 \text{ mm s}^{-1}$$

32.  $R = \frac{\rho l}{A}$  or  $R \propto l$

$\therefore \frac{R_1}{R_2} = \frac{l_1}{l_2} = \frac{L}{L/4} = 4$

or  $R_2 = \frac{R}{4}$  ( $\because R_1 = R$ )

In parallel combination of such four resistance

$$\frac{1}{R'} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{R_4}$$

or  $\frac{1}{R'} = \frac{1}{R/4} + \frac{1}{R/4} + \frac{1}{R/4} + \frac{1}{R/4}$

or  $\frac{1}{R'} = \frac{4}{R} + \frac{4}{R} + \frac{4}{R} + \frac{4}{R}$

or  $\frac{1}{R'} = \frac{16}{R}$

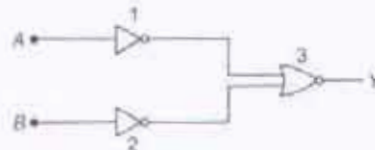
or  $R' = R/16$

33.  $M = M_0 \left(\frac{1}{2}\right)^{t/t_{1/2}}$

$\therefore$

$$M = 200 \left(\frac{1}{2}\right)^{24/7} = 200 \left(\frac{1}{2}\right)^8 = \frac{200}{64} = 3.125 \text{ g}$$

34.



Output of gate 1,  $Y_1 = \bar{A}$

Output of gate 2,  $Y_2 = \bar{B}$

Output of gate 3,

$$Y = Y_1 \times Y_2 = \bar{A} \times \bar{B}$$

$$= \overline{A \times B}$$

$$= AB$$

Which is the output of AND gate.

35. Work function for wavelength of 4100 Å is

$$W = \frac{hc}{\lambda}$$

$$= \frac{6.63 \times 10^{-34} \times 3 \times 10^8}{4100 \times 10^{-10}}$$

$$= 4.8 \times 10^{-19} \text{ J}$$

$$= \frac{4.8 \times 10^{-19}}{1.6 \times 10^{-19}} \text{ eV}$$

$$= 3 \text{ eV}$$

Now, we have

$$W_A = 1.22 \text{ eV}$$

$$W_B = 2.0 \text{ eV}$$

$$W_C = 5 \text{ eV}$$

Since,  $W_A < W$

and  $W_B < W$ , hence A and B will emit photoelectrons.



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36. Distance covered by boy A in time  $t$

$$AC = vt \quad \dots (i)$$

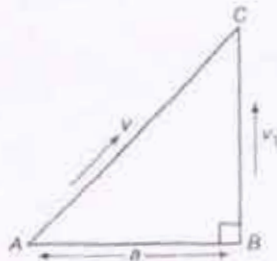
Distance covered by boy B in time  $t$

$$BC = v_1 t \quad \dots (ii)$$

Using Pythagoras theorem

$$AC^2 = AB^2 + BC^2$$

$$\text{or } (vt)^2 = a^2 + (v_1 t)^2$$



$$\text{or } v^2 t^2 - v_1^2 t^2 = a^2$$

$$\text{or } t^2 (v^2 - v_1^2) = a^2 \therefore t = \sqrt{\frac{a^2}{v^2 - v_1^2}}$$

37. Power  $P = i^2 R$

$$\Rightarrow R = \frac{P}{i^2}$$

given,  $P = 1 \text{ W}$ , and  $i = 5 \text{ A}$

$$\therefore R = \frac{1}{(5)^2} = 0.04 \Omega$$

38. Force  $F = at + bt^2$

From principle of homogeneity,

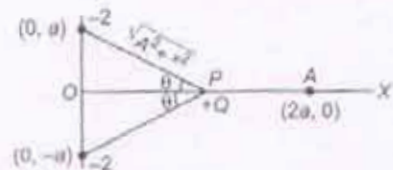
$$\begin{aligned} \text{Dimension of } at &= \frac{[F]}{[t]} = \frac{[MLT^{-2}]}{[T]} \\ &= [MLT^{-3}] \end{aligned}$$

Similarly, dimensions of

$$b = \frac{[F]}{[t^2]} = \frac{[MLT^{-2}]}{[T^2]} [MLT^{-4}]$$

39. Component of force on charge of  $+Q$  at  $P$ , along  $x$ -axis,

$$\begin{aligned} F_x &= \frac{2Qq}{4\pi\epsilon_0(a^2 + x^2)} \times \frac{x}{\sqrt{a^2 + x^2}} \\ &= \frac{2Qqx}{4\pi\epsilon_0(a^2 + x^2)} \times \frac{x}{\sqrt{a^2 + x^2}} \\ &= \frac{2Qqx^2}{4\pi\epsilon_0(a^2 + x^2)^{3/2}} \end{aligned}$$



Which is not directly proportional to  $x$ .  
So, motion is oscillatory but not SHM.

40. The percentage of volume of ice cube outside the water is

$$\begin{aligned} &= \frac{\rho_{\text{water}} - \rho_{\text{ice}}}{\rho_{\text{water}}} \times 100 \\ &= \frac{1000 - 900}{1000} \times 100 = 10\% \end{aligned}$$

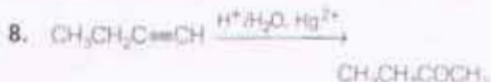
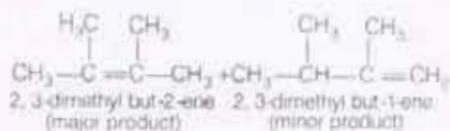
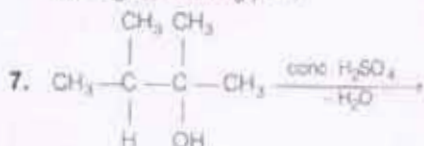
## Chemistry

- $n$ -alkanes, in presence of anhydrous  $\text{AlCl}_3/\text{HCl}$  undergo isomerisation to form branched chain alkanes.
- Only one water molecule, which is outside the brackets (coordination sphere) is hydrogen bonded. The other four molecules of water are coordinated.
- Among the oxoanions of chlorine given in the question,  $\text{ClO}_4^-$  does not disproportionate because in this oxoanion chlorine is present in its highest oxidation state i.e.,  $+7$ .
- $(\text{CH}_3)_3\text{N}$  has unshared pair of electrons which can be donated and shared with an electrophile.
- 1 M of 10 mL  $\text{H}_2\text{SO}_4 = 1 \text{ M}$  of 20 mL  $\text{NH}_3$   
1000 mL of 1 M ammonia contains  
= 14 g nitrogen  
20 mL of 1 M  $\text{NH}_3$  contains  
=  $\frac{14 \times 20}{1000}$  g nitrogen  
% age of nitrogen =  $\frac{14 \times 20 \times 100}{1000 \times 0.5} = 56.0\%$



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6. Compound (II) is most symmetrical because it has both  $\text{CH}_3$  groups and Cl atoms *p*-to each other. Therefore, it fits in the crystal lattice better than the other two isomers and hence it has highest melting point.



9. Due to  $-I$  effect of Cl, chloroacetic acid is a stronger acid than acetic acid. Further due to stabilisation of phenoxide ion by resonance and no such stabilisation in case of ethoxide ion, phenol is a stronger acid than ethanol.

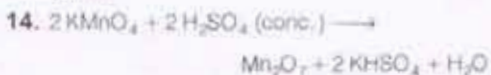
Hence, overall acid strength increases in the order, ethanol < phenol < acetic acid < chloroacetic acid.

10. In fcc structure, there are  $4\text{F}^-$  ions in the packing and hence 4 octahedral voids.

11. 
$$\pi = CRT \text{ or } C = \frac{\pi}{RT}$$
$$= 8.21 \text{ atm} / 0.0821 \text{ L atm K}^{-1} \text{ mol}^{-1} \times 310\text{K}$$
$$= 0.323 \text{ M} = 0.323 \times 180 \text{ gL}^{-1}$$
$$= 58.14 \text{ gL}^{-1}$$

12. At equilibrium, rate of dissolution = rate of crystallisation.

13. Thioisulphato ( $\text{SCN}^-$ ) is ambidentate/unidentate ligand.



15.  $3d^5$  has maximum unpaired electrons ( $5e^-$ ) so it has magnetic moment.

16. Phosphorus belongs to 3rd period and hence contains *d*-orbitals which can form  $p\pi-d\pi$  bonds.

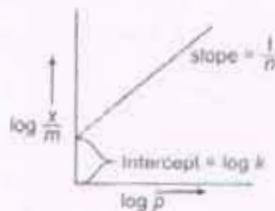
17.  $\text{HI}$  being a stronger reducing agent than  $\text{H}_2\text{SO}_4$ , reduces  $\text{H}_2\text{SO}_4$  to  $\text{SO}_2$  and is itself oxidised to  $\text{I}_2$ .

18. F being smallest has the shortest HF bond and hence HF has the highest bond dissociation energy.

19. Inert electrodes provide surface for oxidation or reduction reaction but not for redox reaction. Hence, option (d) is incorrect.

20.  $E_{\text{cell}}$  is intensive while  $\Delta G$  is extensive. (In the relation,  $\Delta G = -nFE$ ,  $E$  depends only on the nature of the cell reaction so it is intensive whereas value of  $\Delta G$  depends upon the value of  $n$ . So it is extensive.)

21. Option (c) is correct.



According to Freundlich adsorption isotherm, a graph between  $\log \frac{x}{m}$  against  $\log p$  is a straight line with slope equal to  $1/n$  and intercept equal to  $\log k$ .

22. Aluminium is the third most abundant element by mass and iron is the second most abundant metal in the earth's crust.

23. Nitrogen in  $\text{N}_2\text{O}$ ,  $\text{NO}$ ,  $\text{N}_2\text{O}_3$ ,  $\text{NO}_2$  or  $\text{N}_2\text{O}_5$  and  $\text{N}_2\text{O}_5$  nitrogen shows +1, +2, +3, +4 and +5 oxidation states respectively.

24.  $\text{PH}_3 < \text{AsH}_3 < \text{NH}_3$  (enthalpy of vaporisation)

25. A halogen of lower atomic number oxidises halide ions of higher atomic number.

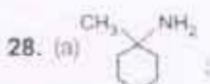


26. A catalyst does not alter the enthalpy change,  $\Delta H$  of the reaction.

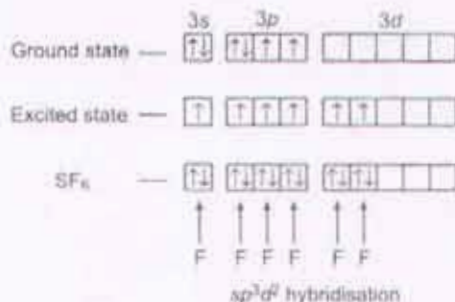




27. Rate =  $k[A][B]$ ; when volume is reduced to  $\frac{1}{4}$ th, concentration will become 4 times:  
Therefore, new rate =  $k[4A][4B] = 16k[A][B]$   
= 16 times



- (b)  $(C_2H_5)_3N$ ,  $3^\circ$   
(c)  $(CH_3)_3C-NH_2$ ,  $1^\circ$   
(d)  $C_6H_5-NH-CH_3$ ,  $2^\circ$
29. Sodium rosinate enhance the lathering property of soap.
30. Deficiency of vitamin 'C' causes scurvy
31. Excess fluoride over 10 ppm causes harmful effects to bones and teeth.
32. Adiabatic process is a process in which there is no transfer of heat between the system and surroundings. ( $q = 0$ )
33.  $\Delta_r G^\circ = 2.303 \log K_p$  ( $R = 8.314 \text{ JK}^{-1} \text{ mol}^{-1}$ )  
 $\Delta_r G^\circ = -2.303 \times 8.314 \text{ JK}^{-1} \text{ mol}^{-1} \times 298K$   
 $\times \log 2.47 \times 10^{-28}$   
 $= 163000 \text{ Jmol}^{-1} = 163 \text{ kJmol}^{-1}$
34. Option (d) is wrong statement.  
 $C_2 (12e^-) = \sigma 1s^2 \sigma^* 1s^2, \sigma 2s^2, \sigma^* 2s^2$   
 $(\pi 2p_x^2 = \pi 2p_y^2)$   
In  $C_2$  molecule, double bond consists of both  $\pi$  bonds.
35.  $S(16 e^-)$  ground state =  $1s^2, 2s^2, 2p^6, 3s^2, 3p^4$



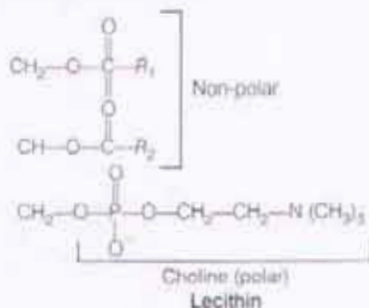
36. Covalent character increases with decrease in the value of difference in electronegativities of binding atoms. Thus, the correct order is  
 $LiCl < BeCl_2 < BCl_3 < CCl_4$
37. Maximum number of electrons in a subshell of atom is determined by  $4l + 2$ .
38. Average kinetic energy per molecule =  $\frac{3}{2} kT$   
 $= \frac{3}{2} \times 1.38 \times 10^{-23} \times 298$   
 $= 6.17 \times 10^{-21} \text{ JK}^{-1} \text{ molecule}^{-1}$
39.  $pH = 7 + \frac{1}{2} [pK_a - pK_b]$   
 $= 7 + \frac{1}{2} [4.76 - 4.75]$   
 $= 7 + \frac{1}{2} \times 0.01 = 7 + 0.005$   
 $= 7.005$
40. Reaction quotient,  $Q_c = \frac{[B][C]}{[A]^2}$   
as  $[A] = [B] = [C] = 3 \times 10^{-4} M$   
 $Q_c = \frac{(3 \times 10^{-4}) \times (3 \times 10^{-4})}{(3 \times 10^{-4})^2} = 1$   
As  $Q_c > K_c$ , so the reaction will proceed in the reverse direction.

## Zoology

- Pellagra is caused by deficiency of vitamin- $B_3$ . Therefore, vitamin- $B_3$  is also known as antipellagra factor. Symptoms of this disease are thick pigmented skin of head, swollen lips and patient feels irritable.
- Notochord originates from mesoderm germ layer.
- Parthenogenesis is a form of sexual reproduction in which the ovum develops into a new individual without fertilisation.
- Bartholin's gland is found in vagina. Bartholin glands are a pair of small glands, which occur on each side of the vaginal opening. These glands correspond to Cowper's gland of male.

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- Each testis contains seminiferous tubules for spermatogenesis and interstitial (Intertubular) tissue rich in Leyding cells for steroidgenesis. Seminiferous epithelium contains a continuous layer of Sertoli cells, which are joined by tight intercellular junctions. These junctions divide the epithelium into a basal compartment that contains spermatogonia and an abdominal compartment.
- Teratogens is an agent that can cause malformations of an embryo or foetus. This can be a chemical substance, a virus or ionising radiation. Mostly, during first three months of pregnancy the pregnant lady should avoid all contact with teratogen.
- A mature ovarian follicle is called Graafian follicle. After ovulation, the empty Graafian follicle shows deposition of lutein and forms corpus luteum that ultimately degenerates.
- Basic amino acids have an additional amino group without forming amides thus, they are diaminomono-carboxylic acids. e.g., lysine, arginine, etc.
- In cell cycle there are two main phases-interphase and mitotic phase. Interphase is divided into three stage  $G_1$ , S and  $G_2$ .  $G_1$  is first growth phase. S is synthetic phase and  $G_2$  is second growth phase.
- 'A' is a structural formula of lecithin. It is probably the most common phospholipid. Phospholipids are major components in the lipid bilayers of cell membrane.



- Centrosome is a self-propagating cytoplasmic organelle, located near nucleus of animal cell.
- The plasmalemma serves as the interface between the machinery in the interior of the cell and the Extracellular Fluid (ECF) that bathes all cells. It is devoid of ribosome.
- In 1824, Pene Dutochiet, a French scientist wrote that all animal and plant tissues were aggregate of globular cells.
- Scientific name of gharial or gavial is *Gavialis gangeticus*, which lives in rivers Ganga and Brahmaputra.
- Cephalochordate have notochord all along the body through out life. But urochordates have notochord in the tail region in their larval stage only.
- In molluscs, the blood is colourless, often having copper containing blue respiratory pigment called haemocyanin.
- Chlorogogen cells are excretory in function. The chlorogogen cells take up excretory matter from the blood capillaries of the gut and from the coelomic fluid of the coelom. They also store glycogen and fat. So, these cells are analogous to the liver of vertebrates.
- |                      |   |              |
|----------------------|---|--------------|
| Cyclostomes          | — | Agantha      |
| Aves                 | — | Tetrapod     |
| Tunicates            | — | Urochordata  |
| <i>Balanoglossus</i> | — | Hemichordata |
| <i>Osteichthyes</i>  | — | Pisces       |
- Chondrichthyes (cartilaginous fishes) are manne. Their mouth is ventral and they have cartilaginous endoskeleton. Dermal placoid scales are present, e.g., Scoliodon, Pristis, etc.
- Study of amphibians and reptiles is called Herpetology. Study of aves is called Ornithology. Study of fishes is called Ichthyology.
- Ligaments join a bone with another bone in movable/synovial joints. Torn ligaments make movement at joints very painful and restricted. It heals only after prolonged movement restriction.
- Mesosomes will be equivalent to mitochondria of eukaryotes because of respiratory enzymes present in aerobic bacteria.



23. Achondroplasia is a defect in the formation of cartilage at the epiphyses of long bones producing a form of dwarfism.
24. Bone marrow is of two types; red and yellow. The yellow marrow is found especially in medullary cavity of long bones, while red is in spongy bones.
25. Neuron — Nissl's bodies  
Bone-matrix — Ossein  
RBCs of man — Non-nucleated  
Lymphocytes — Antibodies
26. Diastema is the gap that separates the biting teeth from the grinding teeth in herbivores. It creates a space in which food can be held ready for the grinding action of the teeth.  
This space is filled by large canine teeth in carnivores.
27. Pepsin is released from peptic cells of the gastric gland on the stomach wall and it can digest milk protein caesin.  
Chymotrypsin is released from the intestine and digest proteins. Ptyalin is released from salivary glands and acts on starch.
28. Goitre is a swelling of the neck due to enlargement of the thyroid gland. This may be due to lack of dietary iodine, which occurs due to decreases thyroid function, which is necessary for the production of thyroxine hormone.  
This was the cause of endemic goitre, formerly common in regions, where the people lacked in their diet iodine.
29. Prolactin or luteotrophic hormone or luteotrophin is a hormone, synthesised and stored in the anterior pituitary gland, that stimulates milk production after child birth and also stimulates production of progesterone by the corpus luteum in the ovary.
30. At its bottom, the trachea (another name for the wind pipe) branches into two tubes called bronchi, which lead into the lungs.  
The larynx is the voice box. It is connected to the windpipe. The oesophagus, like the windpipe, is a tube that runs through the neck. The lungs are the balloon like structure in the chest.
31. Conductivity meter measures soil salinity. Porometer is an apparatus for knowing the relative sizes of stomata. Potometer is used for measuring the rate of transpiration.
32. Both predation and parasitism show negative interactions. In negative interaction one species is harmed (-) while the other is benefitted.
33. Sunlight is the ultimate source of energy as it is the only inexhaustible resource, which is utilised by green plants and is passed on to higher trophic levels through food chain.
34. Endemic species represents a population that are restricted geographically to a particular area in a given time.
35. Species diversity on earth is not uniformly distributed but shows interesting patterns. It is generally highest in the tropics and decreases towards the poles.
36. The effect of cigarette smoking and radon in combination on lungs is synergistic.
37. *Taq* and *Pfu* are thermostable enzymes, which are isolated from thermophilic bacteria. They are DNA polymerase in nature, which are widely used in polymerase chain reaction.
38. Biolistics is a technique for introducing genetic material into living cells, especially plant cells in which DNA-coated microscopic particles are fired into the cell using a special gun.
39. The largest known gene in human is the dystrophin gene, which has 79 exons spanning at least 2300 kb. The human dystrophin gene requires 16 hours to be transcribed.
40. Herbicide resistant gene in plants is *Bt* gene. *Bacillus thuringiensis* is the bacterium that occur naturally in soil. It is now used as herbicide or biopesticide.







19. Bacillariophyceae contains unicellular golden brown autotrophic protists (diatoms). As the name diatoms indicates the body is covered with bivalved Siliceous shell or frustule having an upper half or epitheca and a lower half or hypotheca.
20. Guard cell are the specialised epidermis cells containing chloroplast.
21. Epidermal extensions are always unicellular, while epidermal appendages may be uni or multicellular. Root hairs are epidermal extensions formed by outward elongated bulging of wall of epidermal cells.
22. Lady finger (*Abelmoschus esculentus*) belongs to family—Malvaceae. This family is distinguished by presence of epicalyx, staminal tube, exstrose anthers, monotheccous, and syncarpous ovary.
23. Interxylary phloem is found in *Calotropis* stem. It is said to be interxylary due to its presence inside xylem. It is also found in same member of family— Solanaceae.
24. Secondary meristem are the meristem that are formed secondary from the permanent tissue. Healing of wound in plant take place by the activity of secondary meristem.
25. Angular collenchyma occurs in *Cucurbita*. It has thickening at the angles and there are no intercellular spaces. It is generally found in leaf petioles.
26. In angiosperm, companion cells are living cells along with sieve tube and phloem parenchyma of the phloem. In pteridophytes and gymno sperm phloem is without companion cell.

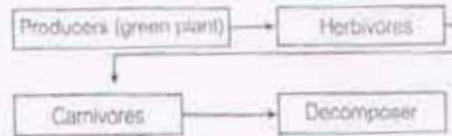
27.	Common Name	Scientific Name	Family	Order	Class
	Wheat	<i>Triticum aestivum</i>	Poaceae	Poales	Monocotyledons
	Mango	<i>Mangifera indica</i>	Anacardiaceae	Sapindales	Dicotyledons
	Housefly	<i>Musca domestica</i>	Muscidal	Diptera	Insecta
	Man	<i>Homo sapiens</i>	Hominidal	Primata	Mammalia

28. Agar-agar is obtained from members of Rhodophyceae algae collectively called agarophytes. These include *Gelidium*, *Gracilaria*, etc.
- Agar is a jelly, like substance used for culturing processes. It is used as laxatives in bacteriological and mycological media.
29. DNA molecule has four bases-adenine, guanine, cytosine and thymine. Adenine always pairs with thymine and guanine pairs with cytosine. Their association is A-T and G-C.
30. According to Chargaff's rules, the amount of adenine is always equal to that of thymine, and the amount of guanine is always equal to that of cytosine.
- A = T(120)  
G = C(120)
- The total number of nucleotides would be  $120 \times 4 = 480$ .
31. Lactose is popularly known as milk sugar. It is a disaccharide composed of one molecule of glucose and one molecule of galactose.
- It is a reducing sugar.
32. Meiosis is best observed in dividing microsporocytes. Microsporocytes or microspore mother cell after meiosis give rise to microspore.
- Other cell do not divide by meiosis.
33. In a majority of water plants like water hyacinth and flowers, water lily emerge above the water level and are pollinated by insects.
34. Pollinia is a coherent mass of pollen grains. They are the product of only one anther lobe, but are transferred during pollination as a single unit.
- This is found in orchids (Orchidaceae).



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35. Morphine is the principle opium alkaloid. It is a strong analgesic. Opium is dried latex of unripe capsular fruits of poppy plant, *Papaver somniferum*. It is eaten or smoked.
36. Pebrine is a disease of silkworm caused by a small parasite, *Nosema*, which has a devastating effect on silk industry.
37. Topographical conditions greatly influence the soil profile (earth surface) within a given climatic region.
38. In an ecosystem, the direction of flow of energy is always in this pattern.



39. If the Bengal Tiger becomes extinct its gene pool will be lost forever. Gene pool is the collective name for all the genes of a particular population.
40. Water hyacinth (phytoplankton), can purify water polluted by biological and chemical wastes-water hyacinth has remarkable capacity to accumulate poisonous metals including radioactive substances.