EAMCET

ENGINEERING ENTRANCE EXAM

SOLVED PAPER 2007

Physics

1. Some physical constants are given in List-I and their dimensional formulae are given in List-II. Match the following

	List-I		List-II
(1)	Planck's constant	(i)	$[ML^{-1}T^{-2}]$
(2)	Gravitational constant	(ii)	$[ML^{-1}T^{-1}]$
(3)	Bulk modulus	(iii)	$[ML^{2}T^{-1}]$
(4)	Coefficient of viscosity	(iv)	$[M^{-1}L^{3}T^{-2}]$

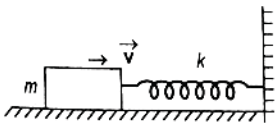
The correct answer is

	(1)	(2)	(3)	(4)
(a)	(iv)	(iii)	(ii)	(i)
(b)	(ii)	(i)	(iii)	(iv)
(c)	(iii)	(ii)	(i)	(iv)
(d)	(iii)	(iv)	(i)	(ii)

2. Velocity and acceleration vectors of charged particle moving perpendicular to the direction of a magnetic field at a given instant of time are $\vec{v} = 2\hat{i} + c\hat{j}$ and $\vec{a} = 3\hat{i} + 4\hat{j}$ respectively. Then the value of c is

(a) 3 (b) 1.5
(c) –1.5 (d) –3

3. A block of mass $m = 25$ kg sliding on a smooth horizontal surface with a velocity $v = 3\ ms^{-1}$ meets the spring of spring constant $k = 100$ N/m fixed at one end as shown in figure. The maximum compression of the spring and velocity of block as it returns to the original position respectively are



(a) 1.5 m, $-3\ ms^{-1}$ (b) 1.5 m, $0.01\ ms^{-1}$
(c) 1.0 m, $3\ ms^{-1}$ (d) 0.5 m, $2\ ms^{-1}$

4. A rifle of 20 kg mass can fire 4 bullets per second. The mass of each bullet is 35×10^{-3} kg and its final velocity is 400 ms^{-1}. Then what force must be applied on the rifle so that it does not move backwards while firing the bullets ?

(a) 80 N (b) 28 N
(c) –112 N (d) –56 N

5. An object of mass 2 m is projected with a speed of 100 ms^{-1} at an angle $\theta = \sin^{-1}\left(\frac{3}{5}\right)$ to the horizontal. At the highest point, the object breaks into two pieces of same mass m and the first one comes to rest. The distance between the point of projection and the point of landing of the bigger piece (in metre) is

(Given, $g = 10\ m/s^2$)

(a) 3840 (b) 1280
(c) 1440 (d) 960

6. Two bodies of 6 kg and 4 kg masses have their velocity $5\hat{i} - 2\hat{j} + 10\hat{k}$ and $10\hat{i} - 2\hat{j} + 5\hat{k}$ respectively. Then the velocity of their centre of mass is

(a) $5\hat{i} + 2\hat{j} - 8\hat{k}$ (b) $7\hat{i} + 2\hat{j} - 8\hat{k}$
(c) $7\hat{i} - 2\hat{j} + 8\hat{k}$ (d) $5\hat{i} - 2\hat{j} + 8\hat{k}$

7. In two separate collisions, the coefficient of restitutions e_1 and e_2 are in the ratio 3 : 1. In the first collision the relative velocity of approach is twice the relative velocity of separation, then the ratio between relative velocity of approach and the relative velocity of separation in the second collision is

(a) 1 : 6 (b) 2 : 3
(c) 3 : 2 (d) 6 : 1

8. A man slides down on a telegraphic pole with an acceleration equal to one-fourth of acceleration due to gravity. The frictional force

between man and pole is equal to in terms of man's weight w

(a) $\frac{w}{4}$ (b) $\frac{w}{2}$

(c) $\frac{3w}{4}$ (d) w

9. A bucket filled with water is tied to a rope of length 0.5 m and is rotated in a circular path in vertical plane. The least velocity it should have at the lowest point of circle so that water does not spill is, ($g = 10\ ms^{-2}$)

(a) $\sqrt{5}$ m/s (b) $\sqrt{10}$ m/s

(c) 5 m/s (d) $2\sqrt{5}$ m/s

10. Two solid spheres (A and B) are made of metals of different densities ρ_A and ρ_B respectively. If their masses are equal, the ratio of their moments of inertia (I_B/I_A) about their respective diameter is

(a) $\left(\frac{\rho_B}{\rho_A}\right)^{2/3}$ (b) $\left(\frac{\rho_A}{\rho_B}\right)^{2/3}$

(c) $\frac{\rho_A}{\rho_B}$ (d) $\frac{\rho_B}{\rho_A}$

11. The mass of a planet is half that of the earth and the radius of the planet is one-fourth that of earth. If we plan to send an artificial satellite from the planet, the escape velocity will be, (escape velocity on earth $v_e = 11\ km\text{-}s^{-1}$)

(a) 11 km-s^{-1} (b) 5.5 km-s^{-1}

(c) 15.55 km-s^{-1} (d) 7.78 km-s^{-1}

12. The magnitude of maximum acceleration is π times that of maximum velocity of a simple harmonic oscillator. The time period of the oscillator in seconds is

(a) 4 (b) 2

(c) 1 (d) 0.5

13. When a wire of length 10 m is subjected to a force of 100 N along its length, the lateral strain produced is 0.01×10^{-3} m. The Poisson's ratio was found to be 0.4. If the area of cross-section of wire is 0.025 m^2, its Young's modulus is

(a) $1.6 \times 10^8\ N/m^2$ (b) $2.5 \times 10^{10}\ N/m^2$

(c) $1.25 \times 10^{11}\ N/m^2$ (d) $16 \times 10^9\ N/m^2$

14. A liquid does not wet the solid surface if the angle of contact is

(a) zero (b) equal to 45°

(c) equal to 90° (d) greater than 90°

15. A horizontal pipe of non-uniform cross-section allows water to flow through it with a velocity 1 ms^{-1} when pressure is 50 kPa at a point. If the velocity of flow has to be 2 ms^{-1} at some other point, the pressure at that point should be

(a) 50 kPa (b) 100 kPa

(c) 48.5 kPa (d) 24.25 kPa

16. A clock which keeps correct time at 20°C, is subjected to 40°C. If coefficient of linear expansion of the pendulum is 12×10^{-6} /°C. How much will it gain or lose time ?

(a) 10.3 s/day (b) 20.6 s/day

(c) 5 s/day (d) 20 min/day

17. Two gases A and B having same pressure P, volume V and absolute temperature T are mixed. If the mixture has the volume and temperature as V and T respectively, then the pressure of the mixture is

(a) $2P$ (b) P

(c) $\frac{P}{2}$ (d) $4P$

18. The temperature of the system decreases in the process of

(a) free expansion

(b) adiabatic expansion

(c) isothermal expansion

(d) isothermal compression

19. Two cylinders A and B fitted with pistons, contain equal number of moles of an ideal monoatomic gas at 400 K. The piston of A is free to move while that of B is held fixed. Same amount of heat energy is given to the gas in each cylinder. If the rise in temperature of the gas in A is 42 K, the rise in temperature of the gas in B is ($\gamma = 5/3$)

(a) 25.2 K (b) 35 K

(c) 42 K (d) 70 K

20. A black body radiates energy at the rate of E watt/m^2 at a high temperature T K. When the temperature is reduced to $\left(\frac{T}{2}\right)$ K, the radiant energy is

(a) $\frac{E}{2}$ (b) $2E$

(c) $\frac{E}{4}$ (d) $\frac{E}{16}$

21. A whistle of frequency 540 Hz rotates in a horizontal circle of radius 2 m at an angular speed of 15 rad/s. The highest frequency heard

by a listener at rest with respect to the centre of circle (velocity of sound in air = 330 ms^{-1})

(a) 590 Hz (b) 594 Hz
(c) 598 Hz (d) 602 Hz

22. A segment of wire vibrates with a fundamental frequency of 450 Hz under a tension of 9 kg wt. Then tension at which the fundamental frequency of the same wire becomes 900 Hz is

(a) 36 kg-wt (b) 27 kg-wt
(c) 18 kg-wt (d) 72 kg-wt

23. Match the following

	List-I		List-II
(1)	Burning candle	(i)	Line spectrum
(2)	Sodium vapour	(ii)	Continuous spectrum
(3)	Bunsen flame	(iii)	Band spectrum
(4)	Dark lines in solar spectrum	(iv)	Absorption spectrum

(a) 1–(iii) 2–(i) 3–(ii) 4–(iv)
(b) 1–(iii) 2–(ii) 3–(i) 4–(iv)
(c) 1–(ii) 2–(iii) 3–(i) 4–(iv)
(d) 1–(ii) 2–(i) 3–(iii) 4–(iv)

24. The refractive index of the material of a double convex lens is 1.5 and its focal length is 5 cm. If the radii of curvature are equal, the value of the radius of curvature (in cm) is

(a) 5.0 (b) 6.5
(c) 8.0 (d) 9.5

25. In Ramsden eyepiece, the two planoconvex lenses each of focal length f are separated by a distance 12 cm. The equivalent focal length (in cm) of the eyepiece is

(a) 10.5 (b) 12.0
(c) 13.5 (d) 15.5

26. In Huygen's eyepiece

(a) the cross wires are outside the eyepiece
(b) condition for achromatism is satisfied
(c) condition for minimum spherical aberration is not satisfied
(d) the image formed by the objective is a virtual image

27. A bar-magnet of moment of inertia 49×10^{-2} kg-m^2 vibrates in a magnetic field of induction 0.5×10^{-4} T. The time period of vibration is 8.8 s. The magnetic moment of the bar magnet is

(a) 350 A-m^2 (b) 490 A-m^2
(c) 3300 A-m^2 (d) 5000 A-m^2

28. A bar magnet of magnetic moment M and moment of inertia I is freely suspended such that the magnetic axial line is in the direction of magnetic meridian. If the magnet is displaced by a very small angle (θ), the angular acceleration is (Magnetic induction of earth's horizontal field = B_H)

(a) $\frac{MB_H\theta}{I}$ (b) $\frac{IB_H\theta}{M}$
(c) $\frac{M\theta}{IB_H}$ (d) $\frac{I\theta}{MB_H}$

29. Along the x-axis, three charges $\frac{q}{2}$, $-q$ and $\frac{q}{2}$ are placed at $x = 0$, $x = a$ and $x = 2a$ respectively. The resultant electric potential at a point P located at a distance r from the charge $-q(a << r)$ is (ε_0 is the permittivity of free space)

(a) $\frac{qa}{4\pi\varepsilon_0 r^2}$ (b) $\frac{qa^2}{4\pi\varepsilon_0 r^3}$
(c) $\frac{q\left(\frac{a^2}{4}\right)}{4\pi\varepsilon_0 r^3}$ (d) $\frac{q}{4\pi\varepsilon_0 r}$

30. Two unit negative charges are placed on a straight line. A positive charge q is placed exactly at the mid point between these unit charges. If the system of these three charges is in equilibrium, the value of q (in C) is

(a) 1.0 (b) 0.75
(c) 0.5 (d) 0.25

31. In a metre bridge experiment, the ratio of the left gap resistance to right gap resistance is 2 : 3, the balance point from left is

(a) 60 cm (b) 50 cm
(c) 40 cm (d) 20 cm

32. An aluminium (resistivity $\rho = 2.2 \times 10^{-8}$ Ω-m) wire of a diameter 1.4 mm is used to make a 4 Ω resistor. The length of the wire is

(a) 220 m (b) 1000 m
(c) 280 m (d) 1 m

33. Temperature of cold junction in a thermo-couple is 10°C and neutral temperature is 270°C, then the temperature of inversion is

(a) 540°C (b) 530°C
(c) 280°C (d) 260°C

34. Two wires A and B are of lengths 40 cm and 30 cm. A is bent into a circle of radius r and B into an arc of radius r. A current i_1 is passed

through A and i_2 through B. To have the same magnetic inductions at the centre, the ratio of $i_1 : i_2$ is

(a) 3 : 4 (b) 3 : 5
(c) 2 : 3 (d) 4 : 3

35. The natural frequency of an L-C circuit is 1,25,000 cycle/s. Then the capacitor C is replaced by another capacitor with a dielectric medium of dielectric constant K. In this case, the frequency decreases by 25 kHz. The value of K is

(a) 3.0 (b) 2.1
(c) 1.56 (d) 1.7

36. An electron beam travels with a velocity of 1.6×10^7 ms^{-1} perpendicularly to magnetic field of intensity 0.1 T. The radius of the path of the electron beam ($m_e = 9 \times 10^{-31}$ kg)

(a) 9×10^{-5} m (b) 9×10^{-2} m
(c) 9×10^{-4} m (d) 9×10^{-3} m

37. The work function of the nickel is 5 eV. When a light of wavelength 2000 Å falls on it, it emits photoelectrons in the circuit. Then the potential difference necessary to stop the fastest electrons emitted is (given $h = 6.67 \times 10^{-34}$ J-s)

(a) 1.0 V (b) 1.75 V
(c) 1.25 V (d) 0.75 V

38. In an experiment on photoelectric emission from a metallic surface, wavelength of incident light is 2×10^{-7} m and stopping potential is 2.5 V. The threshold frequency of the metal (in Hz) approximately (charge of electron $e = 1.6 \times 10^{-19}$ C, Planck's constant $h = 6.6 \times 10^{-34}$ J-s)

(a) 12×10^{15} (b) 9×10^{15}
(c) 9×10^{14} (d) 12×10^{13}

39. In Sun, the important source of energy is

(a) proton-proton cycle
(b) carbon-nitrogen cycle
(c) carbon-carbon cycle
(d) nitrogen-nitrogen cycle

40. In an n-type semiconductor, the fermi energ level lies

(a) in the forbidden energy gap nearer to the conduction band
(b) in the forbidden energy gap nearer to the valence band
(c) in the middle of forbidden energy gap
(d) outside the forbidden energy gap

Chemistry

1. Identify 'B' in the following reaction

$$CH_2{=}CH_2 + HCl \xrightarrow{\text{anhy. } AlCl_3} A + 2[H]$$
$$\xrightarrow[C_2H_5OH]{Zn-Cu} B + HCl$$

(a) CH_4 (b) C_2H_6
(c) C_2H_5Cl (d) C_2H_5OH

2. Which of the following pair of transition metal ions, have the same calculated values of magnetic moment ?

(a) Ti^{2+} and V^{2+} (b) Fe^{2+} and Cu^{2+}
(c) Cr^{2+} and Fe^{2+} (d) Co^{2+} and Ti^{2+}

3. The formula of the product formed, when sodium thiosulphate solution is added to silver bromide is

(a) $Ag_2S_2O_3$ (b) Ag_2S
(c) $Na_3[Ag(S_2O_3)_2]$ (d) $Ag_3[Na(S_2O_3)_2]$

4. The chemical formula of feldspar is

(a) $KAlSi_3O_8$
(b) Na_3AlF_6
(c) $NaAlO_2$
(d) $K_2SO_4 \cdot Al_2(SO_4)_3 \cdot 4Al(OH)_3$

5. **Assertion (A)** : NaCl is less soluble in heavy water than in ordinary water.

Reason (R) : Dielectric constant of ordinary water is more than that of heavy water.

The correct answer is

(a) Both (A) and (R) are true and (R) is the correct explanation of (A)
(b) Both (A) and (R) are true but (R) is not the correct explanation of (A)
(c) (A) is true, but (R) is not true
(d) (A) is not true, but (R) is true

6. Calculate enthalpy for formation of ethylene from the following data

(I) $C_{(graphite)} + O_2(g) \longrightarrow CO_2(g)$; $\Delta H = 393.5$ kJ

(II) $H_2(g) + \frac{1}{2}O_2(g) \longrightarrow H_2O(l)$;

$\Delta H = -286.2$ kJ

(III) $C_2H_4(g) + 3O_2(g) \rightarrow 2CO_2(g) + 2H_2O(l)$;

$\Delta H = -1410.8$ kJ

(a) 54.1 kJ (b) 44.8 kJ
(c) 51.4 kJ (d) 48.4 kJ

7. A radioactive substance ${}_{88}X^{228}$ (IIA) emits 3α and 3β particles to form "Y". To which group of long form of the periodic table does "Y" belong ?
(a) IVA (b) VA
(c) VIA (d) VIIA

8. An oxide of an element is a gas and dissolves in water to give an acidic solution. The element belongs to
(a) II group (b) IV group
(c) VIII group (d) zero group

9. **Assertion (A)** : Equal moles of different substances contain same number of constituent particles.

Reason (R) : Equal weights of different substances contain the same number of constituent particles.

The correct answer is
(a) Both (A) and (R) are true and (R) is the correct explanation of (A)
(b) Both (A) and (R) are true but (R) is not the correct explanation of (A)
(c) (A) is true, but (R) is false
(d) (A) is false but (R) is true

10. Which of the following is not a conjugate acid-base pair ?
(a) HPO_3^{2-}, PO_3^{3-} (b) $H_2PO_4^-$, HPO_4^{2-}
(c) $H_2PO_4^-$, H_3PO_4 (d) $H_2PO_4^-$, PO_3^{3-}

11. The functional groups present in 'salol' are
(a) $-NH_2$ and $-OR$
(b) OH and $-COR$
(c) $-NH_2$ and $-COOH$
(d) $-OH$ and $-COOR$

12. $CaOCl_2 + H_2O \longrightarrow Ca(OH)_2 + X$
$X + CH_3CHO \longrightarrow Y$
$Y + Ca(OH)_2 \longrightarrow CHCl_3$.
What is 'Y'?
(a) $CH_3CH(OH)_2$ (b) CH_2Cl_2
(c) CCl_3CHO (d) CCl_3COCH_3

13. The wavelength of a spectral line emitted by hydrogen atom in the Lyman series is $\frac{16}{15R}$ cm. What is the value of n_2 ? (R = Rydberg constant)
(a) 2 (b) 3
(c) 4 (d) 1

14. The decreasing order of bond dissociation energies of C—C, C—H and H—H bonds is
(a) H—H > —C—H > —C—C —
(b) —C—C— > C—H > H—H
(c) —C—H > —C—C— > H—H
(d) —C—C— > H—H > —C—H

15. 138 g of ethyl alcohol is mixed with 72 g of water. The ratio of mole fraction of alcohol to water is
(a) 3 : 4 (b) 1 : 2
(c) 1 : 4 (d) 1 : 1

16. Which of the following statements is correct ?
(a) Silicon doped with boron is an n-type semiconductor
(b) Silicon doped with arsenic is a p-type semiconductor
(c) Metals are good conductors of electricity
(d) Electrical conductivity of semiconductors decreases with increasing temperature

17. Which of the following is a biodegradable polymer ?
(a) Polythene (b) Bakelite
(c) PHBV (d) PVC

18. $CH_3COOH \xrightarrow{LiAlH_4} A$

$A + CH_3COOH \xrightarrow{H_3O^+} B + H_2O$

In the above reactions 'A' and 'B' respectively are
(a) $CH_3COOC_2H_5$, C_2H_5OH
(b) CH_3CHO, C_2H_5OH
(c) C_2H_5OH, CH_3CHO
(d) C_2H_5OH, $CH_3COOC_2H_5$

19. Hybridisation of oxygen in diethyl ether is
(a) sp (b) sp^2
(c) sp^3 (d) sp^3d

20. Match the following

	Reactants		Products
(A)	C_2H_5Cl, moist Ag_2O	(i)	CH_3CH_2ONO
(B)	C_2H_5Cl, aqueous ethanolic AgCN	(ii)	C_2H_4
(C)	C_2H_5Cl, aqueous ethanolic $AgNO_2$	(iii)	CH_3CH_2OH
(D)	C_2H_5Cl, ethanolic KOH	(iv)	CH_3CH_2NC
		(v)	C_2H_6

The correct match is
(a) A-v, B-iii, C-iv, D-i
(b) A-i, B-ii, C-iii, D-iv
(c) A-iii, B-iv, C-i, D-ii
(d) A-iv, B-i, C-ii, D-v

21. The IUPAC name of the compound $(CH_3)_2CH—CH=CH—CHOH—CH_3$ is
(a) 5-methyl-hex-3-en-2-ol
(b) 2-methyl-hex-3-en-5-ol
(c) 2-hydroxy-5-methyl-3-hexene
(d) 5-hydroxy-2-methyl-3-hexene

22. Which one of the following noble gases is used in miner's cap lamps ?
(a) Helium (b) Neon
(c) Argon (d) Krypton

23. The following are some statements related to VA group hydrides,
I. Reducing property increases from NH_3 to BiH_3.
II. Tendency to donate lone pair decreases from NH_3 to BiH_3.
III. Thermal stability of hydrides decreases from NH_3 to BiH_3.
IV. Bond angle of hydrides decreases from NH_3 to BiH_3.

The correct statements are
(a) I, II, III and IV (b) I, III and IV
(c) I, II and IV (d) I and IV

24. Which one of the following salts give an acidic solution in water ?
(a) CH_3COONa (b) NH_4Cl
(c) NaCl (d) CH_3COONH_4

25. Which of the following is an example of interstitial hydride ?
(a) NH_3 (b) CH_4
(c) ZnH_2 (d) H_2O

26. **Assertion (A) :** A catalyst increases the rate of a reaction.

Reason (R) : In presence of a catalyst, the activation energy of the reaction increases.

The correct answer is
(a) Both (A) and (R) are true and (R) is the correct explanation of (A)
(b) Both (A) and (R) are true but (R) is not the correct explanation of (A)
(c) (A) is true, but (R) is not true
(d) (A) is not true, but (R) is true

27. The maximum number of sub-levels, orbitals and electrons in *N* shell of an atom are respectively
(a) 4, 12, 32 (b) 4, 16, 30
(c) 4, 16, 32 (d) 4, 32, 64

28. Which of the following is not tetrahedral ?
(a) BF_4^- (b) NH_4^+
(c) CO_3^{2-} (d) SO_4^{2-}

29. A certain mass of a gas occupies a volume of 2 L at STP. To what temperature the gas must be heated to double its volume, keeping the pressure constant ?
(a) 100 K (b) 273 K
(c) 273°C (d) 546°C

30. Calculate the emf of the cell
$Cu(s)|Cu^{2+}(aq)||Ag^+(aq)|Ag(s)$

Given
$E^\circ_{Cu^{2+}/Cu} = +0.34$ V, $E^\circ_{Ag^+/Ag} = 0.80$ V
(a) +0.46 V (b) +1.14 V
(c) +0.57 V (d) −0.46 V

31. Which of the following biomolecules acts as specific catalysts in biological reaction ?
(a) Carbohydrates (b) Lipids
(c) Vitamins (d) Enzymes

32. Nitrobenzene on reduction with zinc and NH_4Cl gives
(a) azobenzene
(b) aniline
(c) hydrazobenzene
(d) N-phenyl hydroxylamine

33. An organic compound '*X*' on treatment with pyridinium chloro chromate in dichloromethane gives compound '*Y*'. Compound '*Y*', reacts with I_2 and alkali to form triiodomethane. The compound '*X*' is
(a) C_2H_5OH (b) CH_3CHO
(c) CH_3COCH_3 (d) CH_3COOH

34. Aqueous solution of an organic compound, '*A*' on electrolysis liberates acetylene and CO_2 at anode. '*A*' is
(a) potassium acetate
(b) potassium succinate
(c) potassium citrate
(d) potassium maleate

35. Bhopal gas tragedy of 1984 was caused by
(a) carbon monoxide
(b) phosgene
(c) methyl cyanate
(d) methyl isocyanate

36. Which of the following is not a peroxy acid ?
(a) Perphosphoric acid
(b) Pernitric acid
(c) Perdisulphuric acid
(d) Perchloric acid

37. Calorific value of producer gas is low because of
(a) high percent of N_2
(b) low percent of CO_2
(c) high percent of CO
(d) low percent of N_2

38. Among the following, which is water insoluble ?
(a) Sodium fluoride
(b) Potassium fluoride
(c) Beryllium fluoride
(d) Magnesium fluoride

39. Which of the following is not correct ?
(a) Milk is a naturally occurring emulsion
(b) Gold sol is a lyophilic sol
(c) Physical adsorption decreases with rise in temperature
(d) Chemical adsorption is unilayered

40. The equilibrium constant for the reaction $SO_2(g) + \frac{1}{2}O_2(g) \rightleftharpoons SO_3(g)$ is 5×10^{-2} atm.

The equilibrium constant of the reaction $2SO_3(g) \rightleftharpoons 2SO_2(g) + O_2(g)$ would be
(a) 100 atm (b) 200 atm
(c) 4×10^2 atm (d) 6.25×10^4 atm

Mathematics

1. If Q denotes the set of all rational numbers and $f\left(\frac{p}{q}\right) = \sqrt{p^2 - q^2}$ for any $\frac{p}{q} \in Q$, then observe the following statements.

I. $f\left(\frac{p}{q}\right)$ is real for each $\frac{p}{q} \in Q$

II. $f\left(\frac{p}{q}\right)$ is a complex number for each $\frac{p}{q} \in Q$.

Which of the following is correct ?
(a) Both I and II are true
(b) I is true, II is false
(c) I is false, II is true
(d) Both I and II are false

2. If $f : R \to R$ and is defined by $f(x) = \frac{1}{2 - \cos 3x}$ for each $x \in R$, then the range of f is
(a) (1/3, 1) (b) [1/3, 1]
(c) (1, 2) (d) [1, 2]

3. If $f : R \to R$ and $g : R \to R$ are defined by $f(x) = x - [x]$ and $g(x) = [x]$ for $x \in R$, where $[x]$ is the greatest integer not exceeding x, then for every $x \in R$, $f(g(x))$ is equal to
(a) x (b) 0
(c) $f(x)$ (d) $g(x)$

4. $\sqrt{2 + \sqrt{5} - \sqrt{6 - 3\sqrt{5} + \sqrt{14 - 6\sqrt{5}}}}$ is equal to
(a) 1 (b) 2
(c) 3 (d) 4

5. If $a^x = b^y = c^z = d^w$, the value of $x\left(\frac{1}{y} + \frac{1}{z} + \frac{1}{w}\right)$ is
(a) $\log_a(abc)$ (b) $\log_a(bcd)$
(c) $\log_b(cda)$ (d) $\log_c(dab)$

6. If $S_n = 1^3 + 2^3 + \ldots + n^3$ and $T_n = 1 + 2 + \ldots + n$, then
(a) $S_n = T_{n^3}$ (b) $S_n = T_{n^2}$
(c) $S_n = T_n^2$ (d) $S_n = T_n^3$

7. The number of ways of arranging 8 men and 4 women around a circular table such that no two women can sit together is
(a) 8! (b) 4!
(c) 8!4! (d) $7! \, {}^8P_4$

8. If a polygon of n sides has 275 diagonals, then n is equal to
(a) 25 (b) 35
(c) 20 (d) 15

9. If a_k is the coefficient of x^k in the expansion of $(1 + x + x^2)^n$ for $k = 0, 1, 2, \ldots, 2n$, then $a_1 + 2a_2 + 3a_3 + \ldots + 2n\, a_{2n}$ is equal to
(a) $-a_0$ (b) 3^n
(c) $n \cdot 3^{n+1}$ (d) $n \cdot 3^n$

10. The sum of the series $\frac{3}{4 \cdot 8} - \frac{3 \cdot 5}{4 \cdot 8 \cdot 12} + \frac{3 \cdot 5 \cdot 7}{4 \cdot 8 \cdot 12 \cdot 16} - \ldots$

(a) $\sqrt{\frac{3}{2}} - \frac{3}{4}$ (b) $\sqrt{\frac{2}{3}} - \frac{3}{4}$

(c) $\sqrt{\frac{3}{2}} - \frac{1}{4}$ (d) $\sqrt{\frac{2}{3}} - \frac{1}{4}$

11. If $\frac{3x}{(x-a)(x-b)} = \frac{2}{x-a} + \frac{1}{x-b}$, then $a : b$ is equal to

(a) 1 : 2 (b) −2 : 1

(c) 1 : 3 (d) 3 : 1

12. The coefficient of x^k in the expansion of $\frac{1-2x-x^2}{e^{-x}}$ is

(a) $\frac{1-k-k^2}{k!}$ (b) $\frac{k^2+1}{k!}$

(c) $\frac{1-k}{k!}$ (b) $\frac{1}{k!}$

13. $\frac{1}{2} - \frac{1}{2 \cdot 2^2} + \frac{1}{3 \cdot 2^3} - \frac{1}{4 \cdot 2^4} + \ldots$ is equal to

(a) $\frac{1}{4}$ (b) $\log_3\left(\frac{3}{4}\right)$

(c) $\log_e\left(\frac{3}{2}\right)$ (d) $\log_e\left(\frac{2}{3}\right)$

14. If α and β are the roots of the equation $ax^2 + bx + c = 0$ and, if $px^2 + qx + r = 0$ has roots $\frac{1-\alpha}{\alpha}$ and $\frac{1-\beta}{\beta}$, then r is equal to

(a) $a + 2b$ (b) $a + b + c$

(c) $ab + bc + ca$ (d) abc

15. The set of values of x for which the inequalities $x^2 - 3x - 10 < 0$, $10x - x^2 - 16 > 0$ hold simultaneously, is

(a) (−2, 5) (b) (2, 8)

(c) (−2, 8) (d) (2, 5)

16. If 1, 2, 3 and 4 are the roots of the equation $x^4 + ax^3 + bx^2 + cx + d = 0$, then $a + 2b + c$ is equal to

(a) −25 (b) 0

(c) 10 (d) 24

17. If α, β, γ are the roots of $x^3 - 2x^2 + 3x - 4 = 0$, then the value of $\alpha^2\beta^2 + \beta^2\gamma^2 + \gamma^2\alpha^2$ is

(a) −7 (b) −5

(c) −3 (d) 0

18. If $\begin{bmatrix} 1 & 2 & x \\ 4 & -1 & 7 \\ 2 & 4 & -6 \end{bmatrix}$ is a singular matrix, then x is equal to

(a) 0 (b) 1

(c) −3 (d) 3

19. If A is a square matrix such that $A(\text{adj } A) = \begin{bmatrix} 4 & 0 & 0 \\ 0 & 4 & 0 \\ 0 & 0 & 4 \end{bmatrix}$, then det (adj A) is equal to

(a) 4 (b) 16

(c) 64 (d) 256

20. The number of non-trivial solutions of the system

$x - y + z = 0$, $x + 2y - z = 0$, $2x + y + 3z = 0$ is

(a) 0 (b) 1

(c) 2 (d) 3

21. If $a = \frac{1 - i\sqrt{3}}{2}$, then the correct matching of 'List–I from List–II is

List-I		List-II	
(i)	$a\bar{a}$	(A)	$-\frac{\pi}{3}$
(ii)	$\arg\left(\frac{1}{\bar{a}}\right)$	(B)	$-i\sqrt{3}$
(iii)	$a - \bar{a}$	(C)	$2i/\sqrt{3}$
(iv)	$\text{Im}\left(\frac{4}{3a}\right)$	(D)	1
		(E)	$\pi/3$
		(F)	$\frac{2}{\sqrt{3}}$

correct match is

	(i)	(ii)	(iii)	(iv)
(a)	D	E	C	B
(b)	D	A	B	F
(c)	F	E	B	C
(d)	D	A	B	C

22. The locus of the point $z = x + iy$ satisfying $\left|\frac{z-2i}{z+2i}\right| = 1$ is

(a) x-axis (b) y-axis

(c) $y = 2$ (d) $x = 2$

23. A value of n such that $\left(\frac{\sqrt{3}}{2} + \frac{i}{2}\right)^n = 1$ is

(a) 12 (b) 3

(c) 2 (d) 1

24. If θ lies in the first quadrant and $5\tan\theta = 4$, then $\frac{5\sin\theta - 3\cos\theta}{\sin\theta + 2\cos\theta}$ is equal to

(a) $\frac{5}{14}$ (b) $\frac{3}{14}$

(c) $\frac{1}{14}$ (d) 0

25. If $\cos(A - B) = 3/5$ and $\tan A \tan B = 2$, then which one of the following is true ?
(a) $\sin(A + B) = \frac{1}{5}$ (b) $\sin(A + B) = -\frac{1}{5}$
(c) $\cos(A - B) = \frac{1}{5}$ (d) $\cos(A + B) = -\frac{1}{5}$

26. $\frac{\tan 80° - \tan 10°}{\tan 70°}$ is equal to
(a) 0 (b) 1
(c) 2 (d) 3

27. $\sin A + \sin B = \sqrt{3}(\cos B - \cos A)$
$\Rightarrow \sin 3A + \sin 3B$ is equal to
(a) 0 (b) 2
(c) 1 (d) −1

28. If a, b, c are in AP, $b - a, c - b$ and a are in GP, then $a : b : c$ is
(a) 1 : 2 : 3 (b) 1 : 3 : 5
(c) 2 : 3 : 4 (d) 1 : 2 : 4

29. The value of x, where $x > 0$ and $\tan\left(\sec^{-1}\left(\frac{1}{x}\right)\right) = \sin(\tan^{-1} 2)$ is
(a) $\sqrt{5}$ (b) $\frac{\sqrt{5}}{3}$
(c) 1 (d) 2/3

30. $\sec h^{-1}(\sin\theta)$ is equal to
(a) $\log \tan \frac{\theta}{2}$ (b) $\log \sin \frac{\theta}{2}$
(c) $\log \cos \frac{\theta}{2}$ (d) $\log \cot \frac{\theta}{2}$

31. If two angles of ΔABC are 45° and 60°, then the ratio of the smallest and the greatest sides are
(a) $(\sqrt{3} - 1) : 1$ (b) $\sqrt{3} : \sqrt{2}$
(c) $1 : \sqrt{3}$ (d) $\sqrt{3} : 1$

32. In ΔABC, $(a + b + c)\left(\tan \frac{A}{2} + \tan \frac{B}{2}\right)$ is equal to
(a) $2c \cot \frac{C}{2}$ (b) $2a \cot \frac{A}{2}$
(c) $2b \cot \frac{B}{2}$ (d) $\tan \frac{C}{2}$

33. In ΔABC, with usual notation, observe the two statements given below :
(I) $rr_1r_2r_3 = \Delta^2$
(II) $r_1r_2 + r_2r_3 + r_3r_1 = s^2$
Which of the following is correct ?
(a) Both I and II are true
(b) I is true, II is false
(c) I is false, II is true
(d) Both I and II are false

34. The angle of elevation of an object from a point P on the level ground is α. Moving d metres on the ground towards the object, the angle of elevation is found to be β. Then the height (in metres) of the object is
(a) $d \tan \alpha$ (b) $d \cot \beta$
(c) $\frac{d}{\cot\alpha + \cot\beta}$ (d) $\frac{d}{\cot\alpha - \cot\beta}$

35. If the points whose position vectors are $2\hat{i} + \hat{j} + \hat{k}$, $6\hat{i} - \hat{j} + 2\hat{k}$ and $14\hat{i} - 5\hat{j} + p\hat{k}$ are collinear, then the value of p is
(a) 2 (b) 4
(c) 6 (d) 8

36. The ratio in which $\hat{i} + 2\hat{j} + 3\hat{k}$ divides the join of $-2\hat{i} + 3\hat{j} + 5\hat{k}$ and $7\hat{i} - \hat{k}$ is
(a) 2 : 1 (b) 2 : 3
(c) 3 : 4 (d) 1 : 4

37. If $\vec{a} = \hat{i} - \hat{j} - \hat{k}$ and $\vec{b} = +\lambda\hat{i} - 3\hat{j} + \hat{k}$ and the orthogonal projection of $\vec{b}$ on $\vec{a}$ is $\frac{4}{3}(\hat{i} - \hat{j} - \hat{k})$, then λ is equal to
(a) 0 (b) 2
(c) 12 (d) −1

38. The volume (in cubic units) of the tetrahedron with edges $\hat{i} + \hat{j} + \hat{k}$, $\hat{i} - \hat{j} + \hat{k}$ and $\hat{i} + 2\hat{j} - \hat{k}$ is
(a) 4 (b) 2/3
(c) 1/6 (d) 1/3

39. Let $\vec{a} = a_1\hat{i} + a_2\hat{j} + a_3\hat{k}$
Assertion (A) : The identity
$|\vec{a} \times \hat{i}|^2 + |\vec{a} \times \hat{j}|^2 + |\vec{a} \times \hat{k}|^2 = 2|\vec{a}|^2$ holds for $\vec{a}$.
Reason (R) : $\vec{a} \times \hat{i} = a_3\hat{j} - a_2\hat{k}$,
$\vec{a} \times \hat{j} = a_1\hat{k} - a_3\hat{i}$, $\vec{a} \times \hat{k} = a_2\hat{i} - a_1\hat{j}$
Which of the following is correct ?
(a) Both (A) and (R) are true and (R) is the correct reason for (A)
(b) Both (A) and (R) are true but (R) is not the correct reason for (A)
(c) (A) is true, (R) is false
(d) (A) is false, (R) is true

40. Four numbers are chosen at random from {1, 2, 3, ..., 40}. The probability that they are not consecutive, is

(a) $\frac{1}{2470}$ (b) $\frac{4}{7969}$
(c) $\frac{2469}{2470}$ (d) $\frac{7965}{7969}$

41. If A and B are mutually exclusive events with $P(B) \neq 1$, then $P(A|\bar{B})$ is equal to
(Here $\bar{B}$ is the complement of the event B)
(a) $\frac{1}{P(B)}$ (b) $\frac{1}{1-P(B)}$
(c) $\frac{P(A)}{P(B)}$ (d) $\frac{P(A)}{1-P(B)}$

42. A bag contains 6 white and 4 black balls. Two balls are drawn at random. The probability that they are of the same colour, is
(a) 1/15 (b) 2/5
(c) 4/15 (d) 7/15

43. The mean and standard deviation of a binomial variate X are 4 and $\sqrt{3}$ respectively. Then $P(X \geq 1)$ is equal to
(a) $1-\left(\frac{1}{4}\right)^{16}$ (b) $1-\left(\frac{3}{4}\right)^{16}$
(c) $1-\left(\frac{2}{3}\right)^{16}$ (d) $1-\left(\frac{1}{3}\right)^{16}$

44. The probability distribution of a random variable X is given by

$X = x$	0	1	2	3	4
$P(X = x)$	0.4	0.3	0.1	0.1	0.1

The variance of X is
(a) 1.76 (b) 2.45
(c) 3.2 (d) 4.8

45. In order to eliminate the first degree terms from the equation $2x^2 + 4xy + 5y^2 - 4x - 22y + 7 = 0$, the point to which origin is to be shifted, is
(a) (1, – 3) (b) (2, 3)
(c) (–2, 3) (d) (1, 3)

46. The angle between the line joining the points (1, – 2), (3, 2) and the line $x + 2y - 7 = 0$ is
(a) π (b) $\pi/2$
(c) $\pi/3$ (d) $\pi/6$

47. If $A(2, -1)$ and $B(6, 5)$ are two points the ratio in which the foot of the perpendicular from (4, 1) to AB divides it, is
(a) 8 : 15 (b) 5 : 8
(c) –5 : 8 (d) –8 : 5

48. In the triangle with vertices at $A(6, 3)$, $B(-6, 3)$ and $C(-6, -3)$, the median through A meets BC at P, the line AC meets the x-axis at Q, while R and S respectively denote the orthocentre and centroid of the triangle. Then the correct matching of the coordinates of points in List-I to List-II is

List-I		List-II	
(i)	P	(A)	(0, 0)
(ii)	Q	(B)	(6, 0)
(iii)	R	(C)	(–2, 1)
(iv)	S	(D)	(–6, 0)
		(E)	(–6, –3)
		(F)	(–6, 3)

	(i)	(ii)	(iii)	(iv)
(a)	D	A	E	C
(b)	D	B	E	C
(c)	D	A	F	C
(d)	B	A	F	C

49. The angle between the pair of straight lines formed by joining the points of intersection of $x^2 + y^2 = 4$ and $y = 3x + c$ to the origin is a right angle. Then c^2 is equal to
(a) 20 (b) 13
(c) 1/5 (d) 5

50. If the lines
$x^2 + 2xy - 35y^2 - 4x + 44y - 12 = 0$ and
$5x + \lambda y - 8 = 0$ are concurrent, then the value of λ is
(a) 0 (b) 1
(c) –1 (d) 2

51. The ratio in which yz-plane divides the line segment joining (–3, 4, – 2) and (2, 1, 3) is
(a) –4 : 1 (b) 3 : 2
(c) –2 : 3 (d) 1 : 4

52. The cosine of the angle A of the triangle with vertices $A(1, -1, 2)$, $B(6, 11, 2)$, $C(1, 2, 6)$ is
(a) 63/65 (b) 36/65
(c) 16/65 (d) 13/64

53. The equation of the circle of radius 3 that lies in the fourth quadrant and touching the lines $x = 0$ and $y = 0$ is 4 Qua 1 - negative
(a) $x^2 + y^2 - 6x + 6y + 9 = 0$ 4-positive.
(b) $x^2 + y^2 - 6x - 6y + 9 = 0$
(c) $x^2 + y^2 + 6x - 6y + 9 = 0$
(d) $x^2 + y^2 + 6x + 6y + 9 = 0$

54. The inverse point of (1, 2) with respect to the circle $x^2 + y^2 - 4x - 6y + 9 = 0$ is

(a) (0, 0) (b) (1, 0)
(c) (0, 1) (d) (1, 1)

55. The condition for the coaxial system $x^2 + y^2 + 2\lambda x + c = 0$, where λ is a parameter and c is a constant, to have distinct limiting points, is
(a) $c = 0$ (b) $c < 0$
(c) $c = -1$ (d) $c > 0$

56. For the parabola $y^2 + 6y - 2x + 5 = 0$
(I) The vertex is $(-2, -3)$
(II) The directrix is $y + 3 = 0$
Which of the following is correct ?
(a) Both I and II are true
(b) I is true, II is false
(c) I is false, II is true
(d) Both I and II are false

57. The value of k, if $(1, 2)$, $(k, -1)$ are conjugate points with respect to the ellipse $2x^2 + 3y^2 = 6$ is
(a) 2 (b) 4
(c) 6 (d) 8

58. If the line $lx + my = 1$ is a normal to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$, then $\frac{a^2}{l^2} - \frac{b^2}{m^2}$ is equal to
(a) $a^2 - b^2$ (b) $a^2 + b^2$
(c) $(a^2 + b^2)^2$ (d) $(a^2 - b^2)^2$

59. The area (in square unit) of the triangle formed by the points with polar coordinates $(1, 0)$, $\left(2, \frac{\pi}{3}\right)$ and $\left(3, \frac{2\pi}{3}\right)$ is
(a) $\frac{11\sqrt{3}}{4}$ (b) $\frac{5\sqrt{3}}{4}$
(c) $\frac{5}{4}$ (d) $\frac{11}{4}$

60. $\lim_{x \to 0} \frac{e^x - e^{\sin x}}{2(x - \sin x)}$
(a) $-1/2$ (b) $1/2$
(c) 1 (d) 3/2

61. If $f(x) = \begin{cases} x - 5, & \text{for } x \le 1 \\ 4x^2 - 9, & \text{for } 1 < x < 2 \\ 3x + 4, & \text{for } x \ge 2, \end{cases}$
then $f'(2^+)$ is equal to
(a) 0 (b) 2
(c) 3 (d) 4

62. If $f(x) = \begin{cases} \frac{\sin(1 + [x])}{[x]}, & \text{for } [x] \ne 0 \\ 0, & \text{for } [x] = 0 \end{cases}$
where $[x]$ denotes the greatest integer not exceeding x, then $\lim_{x \to 0} f(x)$ is equal to
(a) -1 (b) 0
(c) 1 (d) 2

63. If $2x^2 - 3xy + y^2 + x + 2y - 8 = 0$, then $\frac{dy}{dx}$ is equal to
(a) $\frac{3y - 4x - 1}{2y - 3x + 2}$ (b) $\frac{3y + 4x + 1}{2y + 3x + 2}$
(c) $\frac{3y - 4x + 1}{2y - 3x - 2}$ (d) $\frac{3y - 4x + 1}{2y + 3x + 2}$

64. $y = \log\left\{\left(\frac{1 + x}{1 - x}\right)^{1/4}\right\} - \frac{1}{2}\tan^{-1}(x)$, then $\frac{dy}{dx}$ is equal to
(a) $\frac{x}{1 - x^2}$ (b) $\frac{x^2}{1 - x^4}$
(c) $\frac{x}{1 + x^4}$ (d) $\frac{x}{1 - x^4}$

65. $x = \cos 0,\ y = \sin 5\theta \Rightarrow (1 - x^2)\frac{d^2y}{dx^2} - x\frac{dy}{dx}$ is equal to
(a) $-5y$ (b) $5y$
(c) $25y$ (d) $-25y$

66. The lengths of tangent, subtangent, normal and subnormal for the curve $y = x^2 + x - 1$ at $(1, 1)$ are A, B, C and D respectively, then their increasing order is
(a) B, D, A, C (b) B, A, C, D
(c) A, B, C, D (d) B, A, D, C

67. The condition $f(x) = x^3 + px^2 + qx + r (x \in R)$ to have no extreme value, is
(a) $p^2 < 3q$ (b) $2p^2 < q$
(c) $p^2 < \frac{1}{4}q$ (d) $p^2 > 3q$

68. The circumference of a circle is measured as 56 cm with an error 0.02 cm. The percentage error in its area is
(a) 1/7 (b) 1/28
(c) 1/14 (d) 1/56

69. Observe the statements given below :
Assertion (A) : $f(x) = xe^{-x}$ has the maximum at $x = 1$
Reason (R) : $f'(1) = 0$ and $f''(1) < 0$
Which of the following is correct ?

(a) Both (A) and (R) are true and (R) is the correct reason for (A)
(b) Both (A) and (R) are true, but (R) is not the correct reason for (A)
(c) (A) is true, (R) is false
(d) (A) is false, (R) is true

70. If $z = \log(\tan x + \tan y)$, then $(\sin 2x)\frac{\partial z}{\partial x} + (\sin 2y)\frac{\partial z}{\partial y}$ is equal to

(a) 1 (b) 2
(c) 3 (d) 4

71. If $\int \frac{e^x - 1}{e^x + 1}\,dx = f(x) + c$, then $f(x)$ is equal to

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

72. $\int \tan^{-1}\left(\sqrt{\frac{1-x}{1+x}}\right)dx$ is equal to

(a) $\frac{1}{2}(x\cos^{-1}x - \sqrt{1-x^2}) + c$
(b) $\frac{1}{2}(x\cos^{-1}x + \sqrt{1-x^2}) + c$
(c) $\frac{1}{2}(x\sin^{-1}x - \sqrt{1-x^2}) + c$
(d) $\frac{1}{2}(x\sin^{-1}x + \sqrt{1-x^2}) + c$

73. $\int \frac{\sin x + 8\cos x}{4\sin x + 6\cos x}\,dx$ is equal to

(a) $x + \frac{1}{2}\log(4\sin x + 6\cos x) + c$
(b) $2x + \log(2\sin x + 3\cos x) + c$
(c) $x + 2\log(2\sin x + 3\cos x) + c$
(d) $\frac{1}{2}\log(4\sin x + 6\cos x) + c$

74. If $f(t) = \int_{-t}^{t} \frac{e^{-|x|}}{2}\,dx$, then $\lim_{t\to\infty} f(t)$ is equal to

(a) 1 (b) $\frac{1}{2}$
(c) 0 (d) -1

75. $\int_0^{2\pi} \sin^6 x \cos^5 x\,dx$ is equal to

(a) 2π (b) $\pi/2$
(c) 0 (d) $-\pi$

76. The area (in square unit) of the region enclosed by the curves $y = x^2$ and $y = x^3$ is

(a) $\frac{1}{12}$ (b) $\frac{1}{6}$
(c) $\frac{1}{3}$ (d) 1

77. The differential equation obtained by eliminating the arbitrary constants a and b from $xy = ae^x + be^{-x}$ is

(a) $x\frac{d^2y}{dx^2} + 2\frac{dy}{dx} - xy = 0$
(b) $\frac{d^2y}{dx^2} + 2y\frac{dy}{dx} - xy = 0$
(c) $x\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + xy = 0$
(d) $\frac{d^2y}{dx^2} + \frac{dy}{dx} - xy = 0$

78. The solution of $(x + y + 1)\frac{dy}{dx} = 1$ is

(a) $y = (x + 2) + ce^x$
(b) $y = -(x + 2) + ce^x$
(c) $x = -(y + 2) + ce^y$
(d) $x = (y + 2)^2 + ce^y$

79. The solution of $\frac{dy}{dx} = \frac{y^2}{xy - x^2}$ is

(a) $e^{y/x} = kx$ (b) $e^{y/x} = ky$
(c) $e^{x/y} = kx$ (d) $e^{-y/x} = ky$

80. The solution of $\frac{dy}{dx} + 1 = e^{x+y}$ is

(a) $e^{-(x+y)} + x + c = 0$
(b) $e^{-(x+y)} - x + c = 0$
(c) $e^{x+y} + x + c = 0$
(d) $e^{x+y} - x + c = 0$

ANSWERS

PHYSICS

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

CHEMISTRY

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

MATHEMATICS

1. (c)	2. (b)	3. (b)	4. (b)	5. (b)	6. (c)	7. (d)	8. (a)	9. (d)	10. (b)
11. (b)	12. (a)	13. (c)	14. (b)	15. (d)	16. (c)	17. (a)	18. (c)	19. (b)	20. (a)
21. (b)	22. (a)	23. (a)	24. (a)	25. (d)	26. (c)	27. (a)	28. (a)	29. (b)	30. (d)
31. (c)	32. (a)	33. (a)	34. (d)	35. (b)	36. (a)	37. (b)	38. (b)	39. (a)	40. (c)
41. (d)	42. (d)	43. (b)	44. (a)	45. (c)	46. (b)	47. (b)	48. (c)	49. (a)	50. (d)
51. (b)	52. (b)	53. (a)	54. (c)	55. (d)	56. (b)	57. (c)	58. (c)	59. (b)	60. (b)
61. (c)	62. (b)	63. (a)	64. (b)	65. (d)	66. (d)	67. (a)	68. (c)	69. (a)	70. (b)
71. (c)	72. (a)	73. (a)	74. (a)	75. (c)	76. (a)	77. (a)	78. (c)	79. (b)	80. (a)