

SUBJECT	TIME
PHYSICS	10.30 A.M. TO 11.50 A.M.

MAXIMUM MARKS	TOTAL DURATION	MAXIMUM TIME FOR ANSWERING
60	80 MINUTES	70 MINUTES

MENTION YOUR CET NUMBER	QUESTION BOOKLET DETAILS	
	VERSION CODE	SERIAL NUMBER
	A - 1	009281

DO's:

1. Check whether the CET No. has been entered and shaded in the respective circles on the OMR answer sheet.
2. This Question Booklet is issued to you by the invigilator after the 2nd Bell i.e., after 10.30 a.m.
3. The Serial Number of this question booklet should be entered on the OMR answer sheet.
4. The Version Code of this question booklet should be entered on the OMR answer sheet and the respective circles should also be shaded completely.
5. Compulsorily sign at the bottom portion of the OMR answer sheet in the space provided.

DON'TS:

1. **THE TIMING MARKS PRINTED ON THE OMR ANSWER SHEET SHOULD NOT BE DAMAGED / MUTILATED/SPOILED.**
2. Until the 3rd Bell is rung at 10.40 a.m.:
 - Do not remove the seal / staple present on the right hand side of this question booklet.
 - Do not look inside this question booklet.
 - Do not start answering on the OMR answer sheet.

INSTRUCTIONS TO CANDIDATES

1. This question booklet contains 60 questions and each question will have four different options / choices.
2. After the 3rd Bell is rung at 10.40 a.m., remove the seal / staple present on the right hand side of this question booklet and start answering on the OMR answer sheet.
3. During the subsequent 70 minutes:
 - Read each question carefully.
 - Choose the correct answer from out of the four available options / choices given under each question.
 - **Completely darken / shade the relevant circle with a BLUE OR BLACK INK BALL POINT PEN against the question number on the OMR answer sheet.**

CORRECT METHOD OF SHADING THE CIRCLE ON THE OMR SHEET IS SHOWN BELOW :



4. Please note that even a minute unintended ink dot on the OMR sheet will also be recognised and recorded by the scanner. Therefore, avoid multiple markings of any kind on the OMR answer sheet.
5. Use the space provided on each page of the question booklet for Rough work AND do not use the OMR answer sheet for the same.
6. After the last bell is rung at 11.50 a.m., stop writing on the OMR answer sheet and affix your LEFT HAND THUMB IMPRESSION on the OMR answer sheet as per the instructions.
7. Hand over the OMR ANSWER SHEET to the room invigilator as it is.
8. After separating and retaining the top sheet (KEA Copy), the invigilator will return the bottom sheet replica (Candidate's copy) to you to carry home for self-evaluation.
9. Preserve the replica of the OMR answer sheet for a minimum period of One year.

P**SEAL**

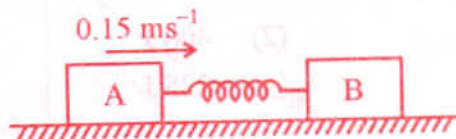
1. The number of significant figures in the numbers 4.8000×10^4 and 48000.50 are respectively
- (1) 5 and 7 (2) 2 and 7
(3) 2 and 6 (4) 5 and 6
2. β -decay means emission of electron from
- (1) a stable nucleus (2) outermost electron orbit
(3) radioactive nucleus (4) innermost electron orbit
3. An electric heater rated 220 V and 550 W is connected to A.C. mains. The current drawn by it is
- (1) 2.5 A (2) 0.4 A
(3) 1.25 A (4) 0.8 A
4. A body of mass 'm' moving along a straight line covers half the distance with a speed of 2 ms^{-1} . The remaining half of the distance is covered in two equal time intervals with a speed of 3 ms^{-1} and 5 ms^{-1} respectively. The average speed of the particle for the entire journey is
- (1) $\frac{8}{3} \text{ ms}^{-1}$ (2) $\frac{4}{3} \text{ ms}^{-1}$
(3) $\frac{16}{3} \text{ ms}^{-1}$ (4) $\frac{3}{8} \text{ ms}^{-1}$
5. The moment of inertia of a circular ring of radius 'r' and mass 'M' about diameter is
- (1) $\frac{Mr^2}{4}$ (2) $\frac{Mr^2}{2}$
(3) $\frac{Mr^2}{12}$ (4) $\frac{2}{5} Mr^2$
6. A body of mass 0.05 kg is observed to fall with an acceleration of 9.5 ms^{-2} . The opposing force of air on the body is _____ ($g = 9.8 \text{ ms}^{-2}$).
- (1) 0.15 N (2) 0.030 N
(3) Zero (4) 0.015 N

Space For Rough Work



7. The colloidal solution in which both the dispersed phase and dispersion medium are liquids called
- (1) gels (2) foams
(3) liquid crystals (4) emulsions
8. In fog, photographs of the objects taken with infra-red radiations are more clear than those obtained during visible light because
- (1) scattering of I-R light is more than visible light
(2) the intensity of I-R light from the object is less
(3) scattering of I-R light is less than visible light
(4) I-R radiation has lesser wavelength than visible radiation
9. Three concurrent co-planar forces 1 N, 2 N and 3 N acting along different directions on a body
- (1) can keep the body in equilibrium if 1 N and 2 N act at right angles.
(2) cannot keep the body in equilibrium.
(3) can keep the body in equilibrium if 1 N and 3 N act at an acute angle.
(4) can keep the body in equilibrium if 2 N and 3 N act at right angles.
10. Sound waves transfer
- (1) energy (2) momentum
(3) both energy and momentum (4) only energy not momentum

11.



Two rectangular blocks A and B of masses 2 kg and 3 kg respectively are connected by a spring of spring constant 10.8 Nm^{-1} are placed on a frictionless horizontal surface. The block 'A' was given an initial velocity of 0.15 ms^{-1} in the direction shown in the figure. The maximum compression of the spring during the motion is

- (1) 0.02 m (2) 0.05 m
(3) 0.03 m (4) 0.01 m

Space For Rough Work

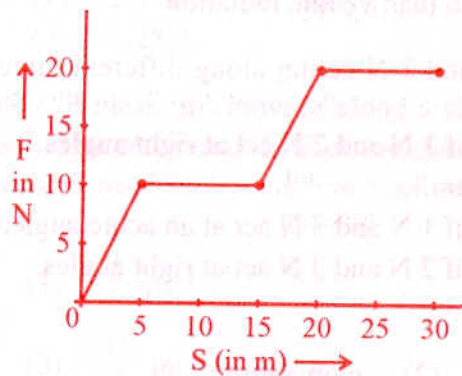
12. G.P. Thomson experimentally confirmed the existence of matter waves by the phenomena

- (1) refraction
- (2) polarisation
- (3) scattering
- (4) diffraction

13. The resistance of a wire at 300 K is found to be 0.3Ω . If the temperature co-efficient of resistance of wire is $1.5 \times 10^{-3} \text{ K}^{-1}$, the temperature at which the resistance becomes 0.6Ω is

- (1) 345 K
- (2) 993 K
- (3) 690 K
- (4) 720 K

14.



The work done by a force acting on a body is as shown in the graph. The total work done in covering an initial distance of 20 m is

- (1) 200 J
- (2) 400 J
- (3) 175 J
- (4) 225 J

15. Two luminous point sources separated by a certain distance are at 10 km from an observer. If the aperture of his eye is $2.5 \times 10^{-3} \text{ m}$ and the wavelength of light used is 500 nm, the distance of separation between the point sources are just seen to be resolved is

- (1) 24.4 m
- (2) 2.44 m
- (3) 1.22 m
- (4) 12.2 m

Space For Rough Work

16. A door of 1.6 m wide requires a force of 1 N to be applied at the free end to open or close it. The force that is required at a point 0.4 m distant from the hinges for opening or closing the door is

- (1) 3.6 N (2) 2.4 N
(3) 4 N (4) 1.2 N

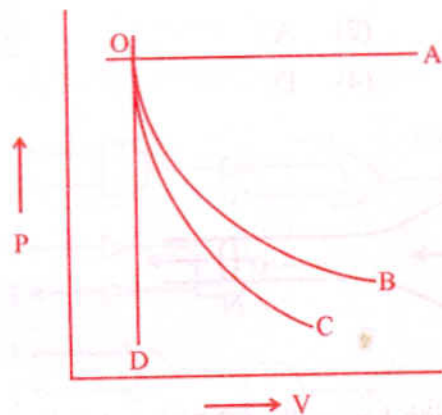
17. 0.1 m^3 of water at 80°C is mixed with 0.3 m^3 of water at 60°C . The final temperature of the mixture is

- (1) 70°C (2) 60°C
(3) 75°C (4) 65°C

18. The spectral series of the hydrogen atom that lies in the visible region of the electromagnetic spectrum

- (1) Balmer (2) Lyman
(3) Brackett (4) Paschen

19.



A graph of pressure versus volume for an ideal gas for different processes is as shown. In the graph curve OC represents

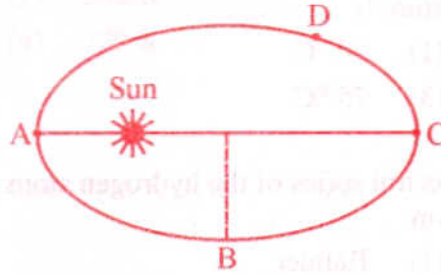
- (1) isothermal process (2) isobaric process
(3) adiabatic process (4) isochoric process

Space For Rough Work

20. Which of the following statement does **not** hold good for thermal radiation ?

- (1) The frequency changes when it travels from one medium to another.
- (2) The speed changes when it travels from one medium to another.
- (3) They travel in straight line in a given medium.
- (4) The wavelength changes when it travels from one medium to another.

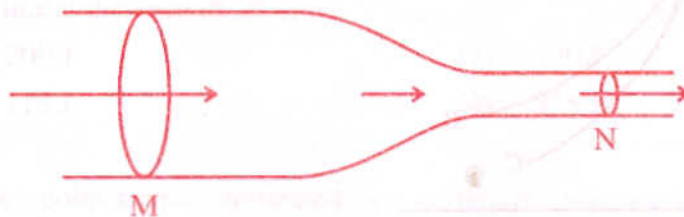
21.



A planet revolves round the Sun in an elliptical orbit. The linear speed of the planet will be maximum at

- (1) B
- (2) A
- (3) C
- (4) D

22.



Horizontal tube of non-uniform cross-section has radii of 0.1 m and 0.05 m respectively at M and N. For a streamline flow of liquid the rate of liquid flow is

- (1) greater at M than at N
- (2) greater at N than at M
- (3) same at M and N
- (4) continuously changes with time

Space For Rough Work

23. A resistor and a capacitor are connected in series with an a.c. source. If the potential drop across the capacitor is 5 V and that across resistor is 12 V, the applied voltage is

- (1) 17 V (2) 5 V
 (3) 12 V (4) 13 V

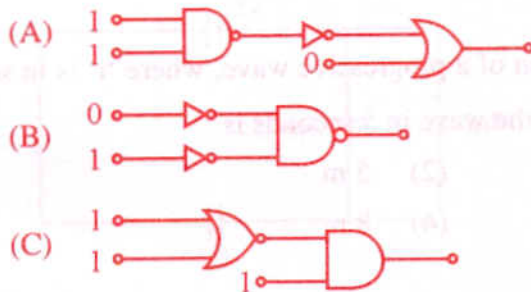
24. The amount of heat energy radiated by a metal at temperature 'T' is 'E'. When the temperature is increased to 3T, energy radiated is

- (1) 9 E (2) 3 E
 (3) 27 E (4) 81 E

25. The angle of minimum deviation for an incident light ray on an equilateral prism is equal to its refracting angle. The refractive index of its material is

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

26.



In the following combination of logic gates, the outputs of A, B and C are respectively

- (1) 0, 1, 0 (2) 1, 1, 0
 (3) 1, 0, 1 (4) 0, 1, 1

Space For Rough Work

27. A stationary point source of sound emits sound uniformly in all directions in a non-absorbing medium. Two points P and Q are at a distance of 4 m and 9 m respectively from the source. The ratio of amplitudes of the waves at P & Q is

(1) $\frac{4}{9}$ (2) $\frac{2}{3}$

(3) $\frac{9}{4}$ (4) $\frac{3}{2}$

28. A galvanometer of resistance 240Ω allows only 4% of the main current after connecting a shunt resistance. The value of the shunt resistance is

(1) 20Ω (2) 8Ω

(3) 5Ω (4) 10Ω

29. The phenomena in which proton flips is

(1) lasers

(2) radioactivity

(3) nuclear fusion

(4) nuclear magnetic resonance

30. $y = 3 \sin \pi \left(\frac{t}{2} - \frac{x}{4} \right)$ represents an equation of a progressive wave, where 't' is in second and 'x' is in metre. The distance travelled by the wave in 5 seconds is

(1) 10 m

(2) 5 m

(3) 32 m

(4) 8 m

31. According to the quark model, it is possible to build all the hadrons using

(1) 3 quarks and 2 antiquarks

(2) 3 quarks and 3 antiquarks

(3) 2 quarks and 2 antiquarks

(4) 2 quarks and 3 antiquarks

Space For Rough Work

32. An α -particle of mass 6.4×10^{-27} kg and charge 3.2×10^{-19} C is situated in a uniform electric field of 1.6×10^5 V m⁻¹. The velocity of the particle at the end of 2×10^{-2} m path when it starts from rest is

- (1) 8×10^5 ms⁻¹ (2) 16×10^5 ms⁻¹
 (3) $4\sqrt{2} \times 10^5$ ms⁻¹ (4) $2\sqrt{3} \times 10^5$ ms⁻¹

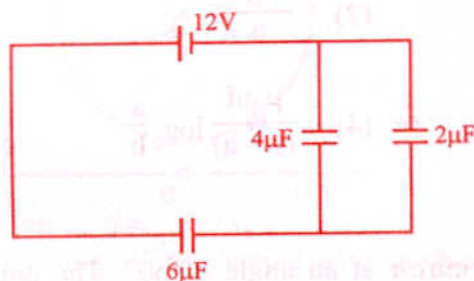
33. A cylindrical tube open at both the ends has a fundamental frequency of 390 Hz in air. If $1/4^{\text{th}}$ of the tube is immersed vertically in water the fundamental frequency of air column is

- (1) 130 Hz (2) 390 Hz
 (3) 520 Hz (4) 260 Hz

34. The surface temperature of the stars is determined using

- (1) Wein's displacement law (2) Rayleigh-Jeans law
 (3) Kirchoff's law (4) Planck's law

35.



The charge deposited on $4 \mu\text{F}$ capacitor in the circuit is

- (1) 12×10^{-6} C (2) 24×10^{-6} C
 (3) 36×10^{-6} C (4) 6×10^{-6} C

Space For Rough Work

36. A parallel beam of light is incident on a converging lens parallel to its principal axis. As one moves away from the lens on the other side of the principal axis, the intensity of light

- (1) continuously increases
- (2) continuously decreases
- (3) first increases and then decreases
- (4) first decreases and then increases

37. Continuous emission spectrum is produced by

- (1) Mercury vapour lamp
- (2) Sodium vapour lamp
- (3) The Sun
- (4) Incandescent electric lamp

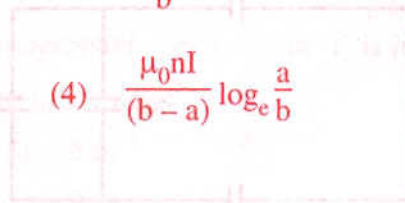
38. A coil of 'n' number of turns is wound tightly in the form of a spiral with inner and outer radii 'a' and 'b' respectively. When a current of strength I is passed through the coil, the magnetic field at its centre is

(1) $\frac{\mu_0 n I}{2(b-a)}$

(2) $\frac{2\mu_0 n I}{b}$

(3) $\frac{\mu_0 n I}{2(b-a)} \log_e \frac{b}{a}$

(4) $\frac{\mu_0 n I}{(b-a)} \log_e \frac{a}{b}$



39. A ray of light is incident on a plane mirror at an angle of 60° . The angle of deviation produced by the mirror is

- (1) 30°
- (2) 60°
- (3) 90°
- (4) 120°

Space For Rough Work

40. The electric potential at any point x, y, z in metres is given by $V = 3x^2$. The electric field at a point $(2 \text{ m}, 0, 1 \text{ m})$ is

(1) -6 V m^{-1}

(2) 6 V m^{-1}

(3) -12 V m^{-1}

(4) 12 V m^{-1}

41. Young's double slit experiment gives interference fringes of width 0.3 mm . A thin glass plate made of material of refractive index 1.5 is kept in the path of light from one of the slits, then the fringe width becomes

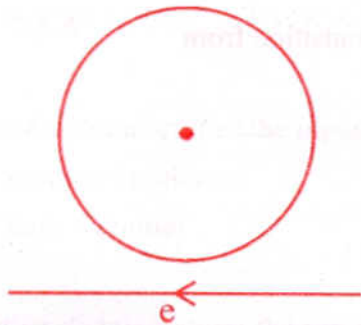
(1) 0.3 mm

(2) 0.45 mm

(3) 0.15 mm

(4) zero

42.



Near a circular loop of conducting wire as shown in the figure an electron moves along a straight line. The direction of the induced current if any in the loop is

(1) clockwise

(2) anticlockwise

(3) zero

(4) variable

Space For Rough Work

43. Hydrogen atom from excited state comes to the ground state by emitting a photon of wavelength λ . If R is the Rydberg constant, the principal quantum number 'n' of the excited state is

(1) $\sqrt{\frac{\lambda}{\lambda R - 1}}$

(2) $\sqrt{\frac{\lambda R^2}{\lambda R - 1}}$

(3) $\sqrt{\frac{\lambda R}{\lambda - 1}}$

(4) $\sqrt{\frac{\lambda R}{\lambda R - 1}}$

44. The magnetic dipole moment of a current loop is independent of

- (1) number of turns
- (2) area of the loop
- (3) current in the loop
- (4) magnetic field in which it is lying

45. In ruby laser, the stimulated emission is due to transition from

- (1) any higher state to lower state
- (2) metastable state to ground state
- (3) any higher state to ground state
- (4) metastable state to any lower state



46. A direct current I flows along the length of an infinitely long straight thin walled pipe, then the magnetic field

- (1) is zero only along the axis of the pipe
- (2) is zero at any point inside the pipe
- (3) is maximum at the centre and minimum at the edges
- (4) is uniform throughout the pipe but not zero

Space For Rough Work

52. A ray of light is incident on a surface of glass slab at an angle 45° . If the lateral shift produced per unit thickness is $\frac{1}{\sqrt{3}}$ m, the angle of refraction produced is

(1) $\tan^{-1}\left(1 - \sqrt{\frac{2}{3}}\right)$

(2) $\sin^{-1}\left(1 - \sqrt{\frac{2}{3}}\right)$

(3) $\tan^{-1}\left(\sqrt{\frac{2}{\sqrt{3}-1}}\right)$

(4) $\tan^{-1}\left(\frac{\sqrt{3}}{2}\right)$

53. Ferromagnetic materials used in a transformer must have

(1) high permeability and low hysteresis loss

(2) high permeability and high hysteresis loss

(3) low permeability and low hysteresis loss

(4) low permeability and high hysteresis loss

54. According to Newton's Corpuscular Theory, the speed of light is

(1) lesser in rarer medium

(2) lesser in denser medium

(3) independent of the medium

(4) same in all the media

55. For the constructive interference the path difference between the two interfering waves must be equal to

(1) $2n\pi$

(2) $n\lambda$

(3) $(2n+1)\frac{\lambda}{2}$

(4) $(2n+1)\lambda$

Space For Rough Work

56. The accurate measurement of emf can be obtained using
- | | |
|-------------------|----------------|
| (1) Voltmeter | (2) Voltmeter |
| (3) Potentiometer | (4) Multimeter |
57. The kinetic energy of an electron gets tripled, then the de-Broglie wavelength associated with it changes by a factor
- | | |
|----------------|--------------------------|
| (1) $\sqrt{3}$ | (2) $\frac{1}{\sqrt{3}}$ |
| (3) 3 | (4) $\frac{1}{3}$ |
58. Which of the following is not a thermodynamic co-ordinate ?
- | | |
|---------------------|----------------------|
| (1) Pressure (P) | (2) Volume (V) |
| (3) Temperature (T) | (4) Gas constant (R) |
59. Two solid pieces, one of steel and the other of aluminium when immersed completely in water have equal weights. When the solid pieces are weighed in air
- | |
|---|
| (1) steel piece will weigh more |
| (2) they have the same weight |
| (3) aluminium piece will weigh more |
| (4) the weight of aluminium is half the weight of steel |
60. The amount of energy released when one microgram of matter is annihilated is
- | | |
|----------------------------|----------------------------|
| (1) 9×10^{10} kWh | (2) 3×10^{10} kWh |
| (3) 0.5×10^5 kWh | (4) 0.25×10^5 kWh |

Space For Rough Work

SUBJECT	TIME
CHEMISTRY	02.30 P.M. TO 03.50 P.M.

MAXIMUM MARKS	TOTAL DURATION	MAXIMUM TIME FOR ANSWERING
60	80 MINUTES	70 MINUTES

MENTION YOUR CET NUMBER	QUESTION BOOKLET DETAILS	
	VERSION CODE	SERIAL NUMBER
	A - 1	603489

DO's:

1. Check whether the CET No. has been entered and shaded in the respective circles on the OMR answer sheet.
2. This Question Booklet is issued to you by the invigilator after the 2nd Bell i.e., after 02.30 p.m.
3. The Serial Number of this question booklet should be entered on the OMR answer sheet.
4. The Version Code of this question booklet should be entered on the OMR answer sheet and the respective circles should also be shaded completely.
5. Compulsorily sign at the bottom portion of the OMR answer sheet in the space provided.

DON'TS:

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2. Until the 3rd Bell is rung at 02.40 p.m.:
 - Do not remove the seal / staple present on the right hand side of this question booklet.
 - Do not look inside this question booklet.
 - Do not start answering on the OMR answer sheet.

INSTRUCTIONS TO CANDIDATES

1. This question booklet contains 60 questions and each question will have four different options / choices.
2. After the 3rd Bell is rung at 02.40 p.m., remove the seal / staple present on the right hand side of this question booklet and start answering on the OMR answer sheet.
3. During the subsequent 70 minutes:
 - Read each question carefully.
 - Choose the correct answer from out of the four available options / choices given under each question.
 - **Completely darken/shade the relevant circle with a BLUE OR BLACK INK BALL POINT PEN against the question number on the OMR answer sheet.**

CORRECT METHOD OF SHADING THE CIRCLE ON THE OMR SHEET IS SHOWN BELOW :



4. Please note that even a minute unintended ink dot on the OMR sheet will also be recognised and recorded by the scanner. Therefore, avoid multiple markings of any kind on the OMR answer sheet.
5. Use the space provided on each page of the question booklet for Rough work AND do not use the OMR answer sheet for the same.
6. After the last bell is rung at 03.50 p.m., stop writing on the OMR answer sheet and affix your LEFT HAND THUMB IMPRESSION on the OMR answer sheet as per the instructions.
7. Hand over the OMR ANSWER SHEET to the room invigilator as it is.
8. After separating and retaining the top sheet (KEA Copy), the invigilator will return the bottom sheet replica (Candidate's copy) to you to carry home for self-evaluation.
9. Preserve the replica of the OMR answer sheet for a minimum period of One year.

C

SEAL

1. The ore that is concentrated by Froth Floatation process is

- | | |
|-------------|---------------|
| (1) Bauxite | (2) Malachite |
| (3) Zincite | (4) Cinnabar |

2. The correct set of four Quantum numbers for outermost electron of Potassium ($Z = 19$) is

- | | |
|----------------------------|----------------------------|
| (1) $4, 0, 0, \frac{1}{2}$ | (2) $3, 0, 0, \frac{1}{2}$ |
| (3) $4, 1, 0, \frac{1}{2}$ | (4) $3, 1, 0, \frac{1}{2}$ |

3. A body of mass x kg is moving with a velocity of 100 ms^{-1} . Its de Broglie wavelength is $6.62 \times 10^{-35} \text{ m}$. Hence x is ($h = 6.62 \times 10^{-34} \text{ Js}$)

- | | |
|-------------|-------------|
| (1) 0.15 kg | (2) 0.2 kg |
| (3) 0.1 kg | (4) 0.25 kg |

4. The correct order of ionisation energy of C, N, O, F is

- | | |
|---------------------|---------------------|
| (1) $C < N < O < F$ | (2) $C < O < N < F$ |
| (3) $F < O < N < C$ | (4) $F < N < C < O$ |

5. The oxide of an element whose electronic configuration is $1s^2 2s^2 2p^6 3s^1$ is

- | | |
|-------------|----------------|
| (1) Basic | (2) Acidic |
| (3) Neutral | (4) Amphoteric |

Space For Rough Work

6. The characteristic not related to alkali metal is
- (1) low melting point
 - (2) low electronegativity
 - (3) high ionisation energy
 - (4) their ions are isoelectronic with noble gases
7. Among the following, the compound that contains ionic, covalent and coordinate linkage is
- (1) NaCl
 - (2) CaO
 - (3) NH_3
 - (4) NH_4Cl
8. A covalent molecule AB_3 has pyramidal structure. The number of lone pair and bond pair electrons in the molecule are respectively
- (1) 3 and 1
 - (2) 1 and 3
 - (3) 2 and 2
 - (4) 0 and 4
9. Excess of carbon dioxide is passed through 50 ml of 0.5 M calcium hydroxide solution. After the completion of the reaction, the solution was evaporated to dryness. The solid calcium carbonate was completely neutralised with 0.1 N Hydrochloric acid. The volume of Hydrochloric acid required is (At. mass of calcium = 40)
- (1) 500 cm^3
 - (2) 400 cm^3
 - (3) 300 cm^3
 - (4) 200 cm^3

Space For Rough Work

10. A bivalent metal has an equivalent mass of 32. The molecular mass of the metal nitrate is
- (1) 192 (2) 188
(3) 182 (4) 168
11. The r.m.s. velocity of molecules of a gas of density 4 kg m^{-3} and pressure $1.2 \times 10^5 \text{ Nm}^{-2}$ is
- (1) 120 ms^{-1} (2) 600 ms^{-1}
(3) 300 ms^{-1} (4) 900 ms^{-1}
12. 0.5 mole of each of H_2 , SO_2 and CH_4 are kept in a container. A hole was made in the container. After 3 hours, the order of partial pressures in the container will be
- (1) $p_{\text{H}_2} > p_{\text{SO}_2} > p_{\text{CH}_4}$ (2) $p_{\text{H}_2} > p_{\text{CH}_4} > p_{\text{SO}_2}$
(3) $p_{\text{SO}_2} > p_{\text{H}_2} > p_{\text{CH}_4}$ (4) $p_{\text{SO}_2} > p_{\text{CH}_4} > p_{\text{H}_2}$
13. The enthalpy of formation of NH_3 is -46 kJ mol^{-1} . The enthalpy change for the reaction :
- $$2\text{NH}_3(\text{g}) \longrightarrow \text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \text{ is}$$
- (1) $+92 \text{ kJ}$ (2) $+46 \text{ kJ}$
(3) $+184 \text{ kJ}$ (4) $+23 \text{ kJ}$
14. 5 moles of SO_2 and 5 moles of O_2 are allowed to react. At equilibrium, it was found that 60% of SO_2 is used up. If the partial pressure of the equilibrium mixture is one atmosphere, the partial pressure of O_2 is
- (1) 0.21 atm (2) 0.41 atm
(3) 0.82 atm (4) 0.52 atm

Space For Rough Work



The equilibrium constant of the above reaction is 6.4 at 300 K. If 0.25 mole each of H_2 and I_2 are added to the system, the equilibrium constant will be

- (1) 3.2 (2) 1.6
(3) 6.4 (4) 0.8

16. Rate of physical adsorption increases with

- (1) decrease in pressure (2) increase in temperature
(3) decrease in surface area (4) decrease in temperature

17. IUPAC name of $(\text{CH}_3)_3\text{CCl}$

- (1) 2 chloro 2 methyl propane (2) t-butyl chloride
(3) n-butyl chloride (4) 3-chloro butane

18. Lucas test is associated with

- (1) Carboxylic acid (2) Alcohols
(3) Aldehydes (4) Phenols

19. An organic compound on heating with CuO produces CO_2 but no water. The organic compound may be

- (1) Methane (2) Ethyl iodide
(3) Carbon tetrachloride (4) Chloroform

Space For Rough Work

20. The condensation polymer among the following is

- (1) PVC
- (2) Polyethene
- (3) Rubber
- (4) Protein

21. The order of stability of metal oxides is

- (1) $\text{Fe}_2\text{O}_3 < \text{Cr}_2\text{O}_3 < \text{Al}_2\text{O}_3 < \text{MgO}$
- (2) $\text{Fe}_2\text{O}_3 < \text{Al}_2\text{O}_3 < \text{Cr}_2\text{O}_3 < \text{MgO}$
- (3) $\text{Al}_2\text{O}_3 < \text{MgO} < \text{Fe}_2\text{O}_3 < \text{Cr}_2\text{O}_3$
- (4) $\text{Cr}_2\text{O}_3 < \text{MgO} < \text{Al}_2\text{O}_3 < \text{Fe}_2\text{O}_3$

22. The temperature of the slag zone in the metallurgy of Iron using blast furnace is

- (1) 400 – 700 °C
- (2) 800 – 1000 °C
- (3) 1200 – 1500 °C
- (4) 1500 – 1600 °C

23. The function of $\text{Fe}(\text{OH})_3$ in the contact process is

- (1) to remove moisture
- (2) to remove dust particles
- (3) to remove arsenic impurity
- (4) to detect colloidal impurity

Space For Rough Work

24. In which of the following, NH_3 is not used ?
- (1) Group reagent for the analysis of IV group basic radical.
 - (2) Group reagent for the analysis of III group basic radical.
 - (3) Tollen's reagent
 - (4) Nessler's reagent
25. Argon is used
- (1) in high temperature welding
 - (2) in radiotherapy for treatment of cancer
 - (3) in filling airships
 - (4) to obtain low temperature
26. The incorrect statement in respect of Chromyl chloride test is
- (1) formation of Chromyl chloride
 - (2) liberation of Chlorine
 - (3) formation of red vapours
 - (4) formation of lead chromate
27. The magnetic moment of a transition metal ion is $\sqrt{15}$ B.M. Therefore the number of unpaired electrons present in it is
- | | |
|-------|-------|
| (1) 1 | (2) 2 |
| (3) 3 | (4) 4 |

Space For Rough Work

28. The IUPAC name of $[\text{Co}(\text{NH}_3)_5 \text{ONO}]^{2+}$ ion is

- (1) Penta ammine nitro cobalt (III) ion
- (2) Penta ammine nitro cobalt (IV) ion
- (3) Penta ammine nitrito cobalt (IV) ion
- (4) Penta ammine nitrito cobalt (III) ion

29. The oxidation state of Fe in the brown ring complex : $[\text{Fe}(\text{H}_2\text{O})_5 \text{NO}]\text{SO}_4$ is

- (1) +2
- (2) +1
- (3) +3
- (4) 0

30. The correct statement with regard to H_2^+ and H_2^- is

- (1) H_2^- is more stable than H_2^+
- (2) H_2^+ is more stable than H_2^-
- (3) Both H_2^+ and H_2^- are equally stable
- (4) Both H_2^+ and H_2^- do not exist

31. Arrange the following in the increasing order of their bond order :

O_2 , O_2^+ , O_2^- and O_2^{2-}

- (1) O_2^+ , O_2 , O_2^- , O_2^{2-}
- (2) O_2 , O_2^+ , O_2^- , O_2^{2-}
- (3) O_2^{2-} , O_2^- , O_2 , O_2^+
- (4) O_2^{2-} , O_2 , O_2^+ , O_2

Space For Rough Work

32. 2 gm of a radioactive sample having half life of 15 days was synthesised on 1st Jan 2009. The amount of the sample left behind on 1st March, 2009 (including both the days)

- (1) 1 gm (2) 0.5 gm
(3) 0 gm (4) 0.125 gm

33. For a chemical reaction $A \rightarrow B$, the rate of the reaction is $2 \times 10^{-3} \text{ mol dm}^{-3} \text{ s}^{-1}$, when the initial concentration is 0.05 mol dm^{-3} . The rate of the same reaction is $1.6 \times 10^{-2} \text{ mol dm}^{-3} \text{ s}^{-1}$ when the initial concentration is 0.1 mol dm^{-3} . The order of the reaction is

- (1) 3 (2) 1
(3) 2 (4) 0

34. For the decomposition of a compound AB at 600 K, the following data were obtained :

[AB] mol dm ⁻³	Rate of decomposition of AB in mol dm ⁻³ s ⁻¹
0.20	2.75×10^{-8}
0.40	11.0×10^{-8}
0.60	24.75×10^{-8}

The order for the decomposition of AB is

- (1) 1 (2) 2
(3) 1.5 (4) 0

Space For Rough Work

35. The rate equation for a reaction : $A \rightarrow B$ is $r = K[A]^0$. If the initial concentration of the reactant is $a \text{ mol dm}^{-3}$, the half life period of the reaction is

(1) $\frac{a}{K}$

(2) $\frac{2a}{K}$

(3) $\frac{a}{2K}$

(4) $\frac{K}{a}$

36. 30 cc of $\frac{M}{3}$ HCl, 20 cc of $\frac{M}{2}$ HNO₃ and 40 cc of $\frac{M}{4}$ NaOH solutions are mixed and the volume was made up to 1 dm³. The pH of the resulting solution is

(1) 1

(2) 3

(3) 8

(4) 2

37. An aqueous solution containing 6.5 gm of NaCl of 90% purity was subjected to electrolysis. After the complete electrolysis, the solution was evaporated to get solid NaOH. The volume of 1 M acetic acid required to neutralise NaOH obtained above is

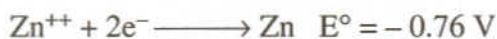
(1) 100 cm³

(2) 200 cm³

(3) 1000 cm³

(4) 2000 cm³

38. The standard electrode potential for the half cell reactions are :



The E.M.F. of the cell reaction :



(1) +1.20 V

(2) +0.32 V

(3) -0.32 V

(4) -1.20 V

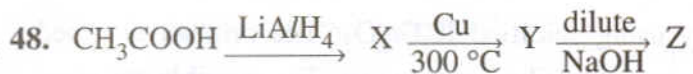
Space For Rough Work

39. 10^{-6} M NaOH is diluted 100 times. The pH of the diluted base is
- (1) between 6 and 7 (2) between 10 and 11
(3) between 7 and 8 (4) between 5 and 6
40. In the electrolysis of acidulated water, it is desired to obtain 1.12 cc of Hydrogen per second under S.T.P. condition. The current to be passed is
- (1) 19.3 Amp (2) 0.965 Amp
(3) 1.93 Amp (4) 9.65 Amp
41. The one which decreases with dilution is
- (1) Specific conductance (2) Equivalent conductance
(3) Molar conductance (4) Conductance
42. Vapour pressure of pure 'A' is 70 mm of Hg at 25 °C. It forms an ideal solution with 'B' in which mole fraction of A is 0.8. If the vapour pressure of the solution is 84 mm of Hg at 25 °C, the vapour pressure of pure 'B' at 25 °C is
- (1) 70 mm (2) 140 mm
(3) 28 mm (4) 56 mm
43. A 6% solution of urea is isotonic with
- (1) 6% solution of Glucose (2) 25% solution of Glucose
(3) 1 M solution of Glucose (4) 0.05 M solution of Glucose

Space For Rough Work

44. In countries nearer to polar region, the roads are sprinkled with CaCl_2 . This is
- (1) to minimise pollution
 - (2) to minimise the accumulation of dust on the road
 - (3) to minimise the wear and tear of the roads
 - (4) to minimise the snow fall.
45. For the reaction $\text{H}_2\text{O} (l) \rightleftharpoons \text{H}_2\text{O}(g)$ at 373 K and one atmospheric pressure
- (1) $\Delta H = T\Delta S$
 - (2) $\Delta H = \Delta E$
 - (3) $\Delta H = 0$
 - (4) $\Delta E = 0$
46. A compound of 'A' and 'B' crystallises in a cubic lattice in which the 'A' atoms occupy the lattice points at the corners of the cube. The 'B' atoms occupy the centre of each face of the cube. The probable empirical formula of the compound is
- (1) AB
 - (2) AB_3
 - (3) AB_2
 - (4) A_3B
47. In electrophillic aromatic substitution reaction, the nitro group is meta directing because it
- (1) increases electron density at meta position
 - (2) increases electron density at ortho and para positions
 - (3) decreases electron density at ortho and para positions
 - (4) decreases electron density at meta position

Space For Rough Work



In the above reaction Z is

- (1) Ketol (2) Acetal
(3) Butanol (4) Aldol

49. The best method for the conversion of an alcohol into an alkyl chloride is by treating the alcohol with

- (1) SOCl_2 in presence of pyridine
(2) Dry HCl in the presence of anhydrous ZnCl_2
(3) PCl_3
(4) PCl_5

50. The electrophile involved in the sulphonation of Benzene is

- (1) H_3O^+ (2) SO_3
(3) SO_3^+ (4) SO_3^{--}

51. The carbon-carbon bond length in Benzene is

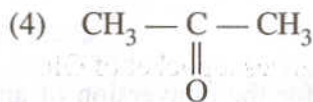
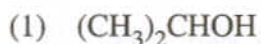
- (1) in between C_2H_6 and C_2H_2 (2) in between C_2H_4 and C_2H_2
(3) in between C_2H_6 and C_2H_4 (4) same as in C_2H_4

52. The compound which is not formed during the dry distillation of a mixture of calcium formate and calcium acetate is

- (1) Propanone (2) Ethanal
(3) Methanal (4) Propanal

Space For Rough Work

53. An organic compound X is oxidised by using acidified $K_2Cr_2O_7$. The product obtained reacts with Phenyl hydrazine but does not answer silver mirror test. The possible structure of X is



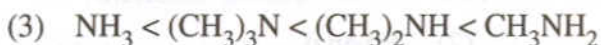
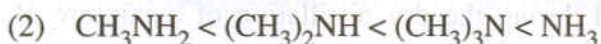
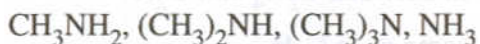
54. The reaction involved in the oil of Winter Green test is Salicylic acid $\xrightarrow[\text{Conc. } H_2SO_4]{\Delta}$ product. The product is treated with Na_2CO_3 solution. The missing reagent in the above reaction is



55. The compound which forms acetaldehyde when heated with dilute NaOH is



56. Arrange the following in the increasing order of their basic strengths :



Space For Rough Work

57. The one which has least Iodine value is

- (1) Ghee
- (2) Groundnut oil
- (3) Sunflower oil
- (4) Ginger oil

58. A diabetic person carries a pocket of Glucose with him always, because

- (1) Glucose reduces the blood sugar level.
- (2) Glucose increases the blood sugar level almost instantaneously.
- (3) Glucose reduces the blood sugar level slowly.
- (4) Glucose increases the blood sugar level slowly.

59. There are 20 naturally occurring amino acids. The maximum number of tripeptides that can be obtained is

- (1) 7465
- (2) 5360
- (3) 8000
- (4) 6470

60. Cooking is fast in a pressure cooker, because

- (1) food is cooked at constant volume.
- (2) loss of heat due to radiation is minimum.
- (3) food particles are effectively smashed.
- (4) water boils at higher temperature inside the pressure cooker.

Space For Rough Work

SUBJECT	TIME
MATHEMATICS	02.30 P.M. TO 03.50 P.M.

MAXIMUM MARKS	TOTAL DURATION	MAXIMUM TIME FOR ANSWERING
60	80 MINUTES	70 MINUTES

MENTION YOUR CET NUMBER	QUESTION BOOKLET DETAILS	
	VERSION CODE	SERIAL NUMBER
	A - 1	203889

DO's:

1. Check whether the CET No. has been entered and shaded in the respective circles on the OMR answer sheet.
2. This Question Booklet is issued to you by the invigilator after the 2nd Bell i.e., after 02.30 p.m.
3. The Serial Number of this question booklet should be entered on the OMR answer sheet.
4. The Version Code of this question booklet should be entered on the OMR answer sheet and the respective circles should also be shaded completely.
5. Compulsorily sign at the bottom portion of the OMR answer sheet in the space provided.

DON'TS:

1. **THE TIMING MARKS PRINTED ON THE OMR ANSWER SHEET SHOULD NOT BE DAMAGED / MUTILATED/SPOILED.**
2. Until the 3rd Bell is rung at 02.40 p.m.:
 - Do not remove the seal / staple present on the right hand side of this question booklet.
 - Do not look inside this question booklet.
 - Do not start answering on the OMR answer sheet.

INSTRUCTIONS TO CANDIDATES

1. This question booklet contains 60 questions and each question will have four different options / choices.
2. After the 3rd Bell is rung at 02.40 p.m., remove the seal / staple present on the right hand side of this question booklet and start answering on the OMR answer sheet.
3. During the subsequent 70 minutes:
 - Read each question carefully.
 - Choose the correct answer from out of the four available options / choices given under each question.
 - **Completely darken/shade the relevant circle with a BLUE OR BLACK INK BALL POINT PEN against the question number on the OMR answer sheet.**

CORRECT METHOD OF SHADING THE CIRCLE ON THE OMR SHEET IS SHOWN BELOW :



4. Please note that even a minute unintended ink dot on the OMR sheet will also be recognised and recorded by the scanner. Therefore, avoid multiple markings of any kind on the OMR answer sheet.
5. Use the space provided on each page of the question booklet for Rough work AND do not use the OMR answer sheet for the same.
6. After the last bell is rung at 03.50 p.m., stop writing on the OMR answer sheet and affix your LEFT HAND THUMB IMPRESSION on the OMR answer sheet as per the instructions.
7. Hand over the OMR ANSWER SHEET to the room invigilator as it is.
8. After separating and retaining the top sheet (KEA Copy), the invigilator will return the bottom sheet replica (Candidate's copy) to you to carry home for self-evaluation.
9. Preserve the replica of the OMR answer sheet for a minimum period of One year.

M**SEAL**

1. If $ax + by = 1$, where a, b, x and y are integers, then which one of the following is not true ?

(1) $(a, b) = 1$

(2) $(a, y) = 1$

(3) $(x, y) = 1$

(4) $(b, y) = 1$

2. The digit in the unit place of the number $\lfloor 2009 + 3^{7886} \rfloor$ is

(1) 9

(2) 7

(3) 3

(4) 1

3. If $\begin{vmatrix} x+1 & x+2 & x+a \\ x+2 & x+3 & x+b \\ x+3 & x+4 & x+c \end{vmatrix} = 0$, then

a, b, c are

(1) in A.P.

(2) in G.P.

(3) in H.P.

(4) equal

4. The value of $\begin{vmatrix} 1 & \log_x y & \log_x z \\ \log_y x & 1 & \log_y z \\ \log_z x & \log_z y & 1 \end{vmatrix} =$

(1) $\log xyz$

(2) 0

(3) 1

(4) xyz

Space For Rough Work



5. If $A = \begin{bmatrix} 2 & 1 & 0 \\ 0 & 2 & 1 \\ 1 & 0 & 2 \end{bmatrix}$ then $|\text{adj } A| =$

(1) 81

(2) 0

(3) 9

(4) $\frac{1}{9}$

6. If A and B are square matrices of the same order such that $(A + B)(A - B) = A^2 - B^2$, then $(ABA^{-1})^2 =$

(1) A^2

(2) B^2

(3) I

(4) A^2B^2

7. If $\vec{a} \cdot \vec{b} = -|\vec{a}||\vec{b}|$, then the angle between \vec{a} and \vec{b} is

(1) 60°

(2) 45°

(3) 180°

(4) 90°

8. If $\vec{a} + 2\vec{b} + 3\vec{c} = \vec{O}$, then $\vec{a} \times \vec{b} + \vec{b} \times \vec{c} + \vec{c} \times \vec{a} =$

(1) $6(\vec{b} \times \vec{c})$

(2) $2(\vec{b} \times \vec{c})$

(3) $3(\vec{c} \times \vec{a})$

(4) \vec{O}

Space For Rough Work

9. If the volume of the parallelopiped with \vec{a} , \vec{b} and \vec{c} as coterminous edges is 40 cubic units, then the volume of the parallelopiped having $\vec{b} + \vec{c}$, $\vec{c} + \vec{a}$ and $\vec{a} + \vec{b}$ as coterminous edges in cubic units is

- (1) 40 (2) 80
(3) 120 (4) 160

10. In the group $G = \{0, 1, 2, 3, 4, 5\}$ under addition modulo 6, $(2 \oplus_6 3^{-1} \oplus_6 4)^{-1} =$

- (1) 0 (2) 2
(3) 3 (4) 5

11. Which one of the following is not true ?

- (1) Identity element in a group is unique.
(2) Inverse of an element in a group is unique.
(3) Fourth roots of unity form an additive abelian group.
(4) Cancellation laws hold in a group.

12. The number of subgroups of the group (\mathbb{Z}_5, \oplus_5) is

- (1) 2 (2) 1
(3) 3 (4) 4

13. The negation of $p \wedge (1 \rightarrow \sim r)$ is

- (1) $\sim p \vee (q \wedge r)$ (2) $\sim p \wedge (q \wedge r)$
(3) $p \vee (q \vee r)$ (4) $p \vee (q \wedge r)$

Space For Rough Work

14. If $n = \lfloor 2020 \rfloor$, then

$$\frac{1}{\log_2 n} + \frac{1}{\log_3 n} + \frac{1}{\log_4 n} + \dots + \frac{1}{\log_{2020} n} =$$

- (1) 0 (2) 2020
(3) 1 (4) $\lfloor 2020 \rfloor$

15. If 'n' is a positive integer, then $n^3 + 2n$ is divisible by

- (1) 3 (2) 2
(3) 6 (4) 15

16. On the set of integers Z , define $f : Z \rightarrow Z$ as $f(n) = \begin{cases} \frac{n}{2}, & n \text{ is even} \\ 0, & n \text{ is odd} \end{cases}$ then 'f' is

- (1) bijective (2) injective but not surjective
(3) neither injective nor surjective (4) surjective but not injective

17. If α and β are the roots of $x^2 + x + 1 = 0$, then $\alpha^{16} + \beta^{16} =$

- (1) 0 (2) 1
(3) -1 (4) 2

18. The total number of terms in the expansion of $(x + y)^{100} + (x - y)^{100}$ after simplification is

- (1) 50 (2) 51
(3) 202 (4) 100

Space For Rough Work

19. $\cot^{-1}(2 \cdot 1^2) + \cot^{-1}(2 \cdot 2^2) + \cot^{-1}(2 \cdot 3^2) + \dots$ up to $\infty =$

(1) $\frac{\pi}{5}$

(2) $\frac{\pi}{4}$

(3) $\frac{\pi}{3}$

(4) $\frac{\pi}{2}$

20. If 'x' takes negative permissible value, then $\sin^{-1} x$ is equal to

(1) $\cos^{-1} \sqrt{1-x^2}$

(2) $-\cos^{-1} \sqrt{1-x^2}$

(3) $\cos^{-1} \sqrt{x^2-1}$

(4) $\pi - \cos^{-1} \sqrt{1-x^2}$

21. If $1 + \sin x + \sin^2 x + \dots$ up to $\infty = 4 + 2\sqrt{3}$, $0 < x < \pi$ and $x \neq \frac{\pi}{2}$, then $x =$

(1) $\frac{\pi}{6}, \frac{\pi}{3}$

(2) $\frac{\pi}{3}, \frac{5\pi}{6}$

(3) $\frac{2\pi}{3}, \frac{\pi}{6}$

(4) $\frac{\pi}{3}, \frac{2\pi}{3}$

22. The complex number $\frac{1+2i}{1-i}$ lies in

(1) first quadrant

(2) second quadrant

(3) third quadrant

(4) fourth quadrant

23. If P is the point in the Argand diagram corresponding to the complex number $\sqrt{3} + i$ and if OPQ is an isosceles right angled triangle, right angled at 'O', then Q represents the complex number

(1) $-1 \pm i\sqrt{3}$

(2) $-1 + i\sqrt{3}$ or $1 - i\sqrt{3}$

(3) $1 \pm i\sqrt{3}$

(4) $\sqrt{3} - i$ or $1 - i\sqrt{3}$

Space For Rough Work

24. The smallest positive integral value of 'n' such that $\left[\frac{1 + \sin \frac{\pi}{8} + i \cos \frac{\pi}{8}}{1 + \sin \frac{\pi}{8} - i \cos \frac{\pi}{8}} \right]^n$ is purely imaginary is, n =

- (1) 8 (2) 4
 (3) 3 (4) 2

25. Which one of the following is possible ?

- (1) $\cos \theta = \frac{7}{3}$ (2) $\sin \theta = \frac{a^2 + b^2}{a^2 - b^2}, (a \neq b)$
 (3) $\sec \theta = \frac{4}{5}$ (4) $\tan \theta = 45$

26. If one side of a triangle is double the other and the angles opposite to these sides differ by 60° , then the triangle is

- (1) right angled (2) obtuse angled
 (3) acute angled (4) isosceles

27. $3(\sin x - \cos x)^4 + 6(\sin x + \cos x)^2 + 4(\sin^6 x + \cos^6 x) =$

- (1) 11 (2) 12
 (3) 13 (4) 14

Space For Rough Work

28. A cow is tied to a post by a rope. The cow moves along the circular path always keeping the rope tight. If it describes 44 metres, when it has traced out 72° at the centre, the length of the rope is

- (1) 35 metres (2) 22 metres
(3) 56 metres (4) 45 metres

29. If $\begin{vmatrix} 1 + \sin^2\theta & \cos^2\theta & 4 \sin 2\theta \\ \sin^2\theta & 1 + \cos^2\theta & 4 \sin 2\theta \\ \sin^2\theta & \cos^2\theta & 4 \sin 2\theta - 1 \end{vmatrix} = 0$ and $0 < \theta < \frac{\pi}{2}$, then $\cos 4\theta =$

- (1) $\frac{1}{2}$ (2) $\frac{\sqrt{3}}{2}$
(3) 0 (4) $-\frac{1}{2}$

30. The locus of the mid points of the chords of the circle $x^2 + y^2 = 4$ which subtend a right angle at the origin is

- (1) $x + y = 2$ (2) $x^2 + y^2 = 1$
(3) $x^2 + y^2 = 2$ (4) $x + y = 1$

31. The length of the chord joining the points $(4 \cos\theta, 4 \sin\theta)$ and $(4 \cos(\theta + 60^\circ), 4 \sin(\theta + 60^\circ))$ of the circle $x^2 + y^2 = 16$ is

- (1) 2 (2) 4
(3) 8 (4) 16

Space For Rough Work

32. The number of common tangents to the circles $x^2 + y^2 - y = 0$ and $x^2 + y^2 + y = 0$ is
- (1) 1 (2) 2
(3) 3 (4) 0

33. The co-ordinates of the centre of the smallest circle passing through the origin and having $y = x + 1$ as a diameter are

- (1) $\left(\frac{-1}{2}, \frac{1}{2}\right)$ (2) $\left(\frac{1}{2}, \frac{-1}{2}\right)$
(3) $\left(\frac{1}{2}, \frac{1}{3}\right)$ (4) $(-1, 0)$

34. The length of the diameter of the circle which cuts three circles

$$x^2 + y^2 - x - y - 14 = 0 ;$$

$$x^2 + y^2 + 3x - 5y - 10 = 0 ;$$

$$x^2 + y^2 - 2x + 3y - 27 = 0$$

orthogonally, is

- (1) 2 (2) 8
(3) 6 (4) 4

35. For the parabola $y^2 = 4x$, the point P whose focal distance is 17, is

- (1) (16, 8) or (16, -8) (2) (8, 8) or (8, -8)
(3) (4, 8) or (4, -8) (4) (2, 8) or (2, -8)

Space For Rough Work

36. The angle between the tangents drawn to the parabola $y^2 = 12x$ from the point $(-3, 2)$ is
- (1) 45° (2) 90°
 (3) 60° (4) 30°
37. The number of values of 'c' such that the line $y = 4x + c$ touches the curve $\frac{x^2}{4} + y^2 = 1$ is
- (1) 0 (2) 1
 (3) 2 (4) infinite
38. If the circle $x^2 + y^2 = a^2$ intersects the hyperbola $xy = c^2$ in four points $P(x_1, y_1)$, $Q(x_2, y_2)$, $R(x_3, y_3)$ and $S(x_4, y_4)$, then
- (1) $x_1 + x_2 + x_3 + x_4 = 0$ (2) $y_1 + y_2 + y_3 + y_4 = 2$
 (3) $x_1 x_2 x_3 x_4 = 2c^4$ (4) $y_1 y_2 y_3 y_4 = 2c^4$
39. The foot of the perpendicular from the point $(2, 4)$ upon $x + y = 4$ is
- (1) $(3, -1)$ (2) $(2, 2)$
 (3) $(4, 0)$ (4) $(1, 3)$
40. The vertices of a triangle are $(6, 0)$, $(0, 6)$ and $(6, 6)$. The distance between its circumcentre and centroid is
- (1) $2\sqrt{2}$ (2) 2
 (3) $\sqrt{2}$ (4) 1

Space For Rough Work

41. The angle between the pair of lines

$$x^2 + 2xy - y^2 = 0$$

is

(1) $\frac{\pi}{3}$

(2) $\frac{\pi}{6}$

(3) $\frac{\pi}{2}$

(4) 0

42. $\lim_{n \rightarrow \infty} \frac{3 \cdot 2^{n+1} - 4 \cdot 5^{n+1}}{5 \cdot 2^n + 7 \cdot 5^n} =$

(1) 0

(2) $\frac{3}{5}$

(3) $\frac{-4}{7}$

(4) $\frac{-20}{7}$

43. The function

$$f(x) = \frac{\log(1+ax) - \log(1-bx)}{x}$$

is not defined at $x = 0$. The value which should be assigned to 'f' at $x = 0$ so that it is continuous at $x = 0$ is

(1) 0

(2) $a - b$

(3) $a + b$

(4) $\log a + \log b$

44. If $f(x) = 1 + nx + \frac{n(n-1)}{2}x^2 + \frac{n(n-1)(n-2)}{6}x^3 + \dots + x^n$, then $f''(1) =$

(1) $n(n-1)2^n$

(2) $n(n-1)2^{n-1}$

(3) $(n-1)2^{n-1}$

(4) $n(n-1)2^{n-2}$

Space For Rough Work

45. If $f(x) = \log_x 2 (\log_e x)$, then $f'(x)$ at $x = e$ is

(1) 0

(2) 1

(3) $\frac{1}{e}$

(4) $\frac{1}{2e}$

46. If $y = \sin^n x \cos nx$, then $\frac{dy}{dx}$ is

(1) $n \sin^{n-1} x \cos (n+1) x$

(2) $n \sin^{n-1} x \sin(n+1) x$

(3) $n \sin^{n-1} x \cos(n-1) x$

(4) $n \sin^{n-1} x \cos nx$

47. If $f(x) = \frac{g(x) + g(-x)}{2} + \frac{2}{[h(x) + h(-x)]^{-1}}$ where g and h are differentiable functions, then $f'(0)$

(1) 0

(2) 1

(3) $\frac{1}{2}$

(4) $\frac{3}{2}$

48. The tangent to a given curve $y = f(x)$ is perpendicular to the x -axis if

(1) $\frac{dy}{dx} = 0$

(2) $\frac{dy}{dx} = 1$

(3) $\frac{dx}{dy} = 0$

(4) $\frac{dx}{dy} = 1$

Space For Rough Work

49. The minimum value of $27^{\cos 2x} 81^{\sin 2x}$ is

(1) $\frac{1}{27}$

(2) -5

(3) $\frac{1}{5}$

(4) $\frac{1}{243}$

50. A stone is thrown vertically upwards from the top of a tower 64 metres high according to the law $s = 48t - 16t^2$. The greatest height attained by the stone above the ground is

(1) 64 metre

(2) 36 metre

(3) 32 metre

(4) 100 metre

51. The length of the subtangent at 't' on the curve $x = a(t + \sin t)$, $y = a(1 - \cos t)$ is

(1) $2a \sin^3\left(\frac{t}{2}\right) \sec\left(\frac{t}{2}\right)$

(2) $a \sin t$

(3) $2a \sin\left(\frac{t}{2}\right) \tan\left(\frac{t}{2}\right)$

(4) $2a \sin \frac{t}{2}$

52. $\int e^{\tan^{-1}x} \left(1 + \frac{x}{1+x^2}\right) dx$ is equal to

(1) $\frac{1}{2} x e^{\tan^{-1}x} + c$

(2) $x e^{\tan^{-1}x} + c$

(3) $e^{\tan^{-1}x} + c$

(4) $\frac{1}{2} e^{\tan^{-1}x} + c$

Space For Rough Work

53. $\int \operatorname{cosec}(x-a) \operatorname{cosec} x \, dx =$

(1) $\frac{1}{\sin a} \log [\sin(x-a) \sin x] + C$ (2) $\frac{-1}{\sin a} \log |\sin x \operatorname{cosec}(x-a)| + C$

(3) $\frac{-1}{\sin a} \log [\sin(x-a) \sin x] + C$ (4) $\frac{1}{\sin a} \log [\sin(x-a) \operatorname{cosec} x] + C$

54. If $f(x) = \int_{-1}^x |t| \, dt$, then for any $x \geq 0$, $f(x) =$

(1) $\frac{1}{2}(1-x^2)$ (2) $1-x^2$

(3) $\frac{1}{2}(1+x^2)$ (4) $1+x^2$

55. $\int_1^3 \frac{\sqrt{4-x}}{\sqrt{x} + \sqrt{4-x}} \, dx =$

(1) 0 (2) 1

(3) 3 (4) 2

56. The area bounded between the parabola $y^2 = 4x$ and the line $y = 2x - 4$ is equal to

(1) 15 sq. units (2) $\frac{17}{3}$ sq. units

(3) $\frac{19}{3}$ sq. units (4) 9 sq. units

Space For Rough Work

57. The differential equation of the family of circles passing through the origin and having their centres on the x -axis is

(1) $x^2 = y^2 + 3xy \frac{dy}{dx}$

(2) $y^2 = x^2 + 2xy \frac{dy}{dx}$

(3) $y^2 = x^2 - 2xy \frac{dy}{dx}$

(4) $x^2 = y^2 + xy \frac{dy}{dx}$

58. A population grows at the rate of 10% of the population per year. How long does it take for the population to double ?

(1) $2 \log 10$ years

(2) $20 \log 2$ years

(3) $10 \log 2$ years

(4) $5 \log 2$ years

59. On the set of all natural numbers N , which one of the following $*$ is a binary operation ?

(1) $a * b = 3a - 4b$

(2) $a * b = \sqrt{ab}$

(3) $a * b = \frac{a-b}{a+b}$

(4) $a * b = a + 3b$

60. If $\int_0^1 f(x) dx = 5$, then the value of $\dots + 100 \int_0^1 x^9 f(x^{10}) dx$ is equal to

(1) 55

(2) 125

(3) 625

(4) 275

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