KELVIN

IIT-JEE | MEDICAL | FOUNDATIONS

KELVIN Entrance Test (KET)

Class : 12th Passed (Engineering)

Code : A

Time : 80 minutes **MM : 171**

Registration Number : .....

Name of the Candidate : .....

Test Centre : .....

Instructions :

Caution : Class, Paper, Code as given above must be correctly marked in the answer OMR sheet before attempting the paper. Wrong Class, Paper or Code will give wrong results.

1. This question paper consists of 45 questions. All questions will be multiple choice single correct out of four choices with marking scheme in table below.

Subject	Question No.	Marking scheme for each question	
		Correct Answer	Incorrect Answer
PHYSICS	Q. 1-6	+3	0
	Q. 7-12	+4	0
	Q. 13-15	+5	0
CHEMISTRY	Q. 16-21	+3	0
	Q. 22-27	+4	0
	Q. 28-30	+5	0
MATHEMATICS	Q. 31-36	+3	0
	Q. 37-42	+4	0
	Q. 43-45	+5	0

2. Answers have to be marked on the OMR sheet. The Question Paper contains blank spaces for your rough work. No additional sheets will be provided for rough work.
3. Blank papers, clip boards, log tables, slide rule, calculator, cellular phones, pagers and electronic devices, in any form, are not allowed.

4. Before attempting paper write your Registration Number, Name and Test Centre in the space provided at the top of this sheet.
5. See method of marking of bubbles of the back of cover page for question no. 1 to 45.

Note : Please check this Question Paper contains all 45 questions in serial order. If not so, exchange for the correct Question Paper.

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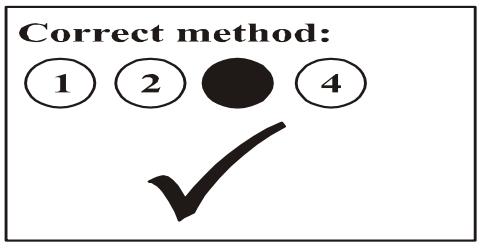
Method of marking of bubbles for questions number 1 to 45.

For example :

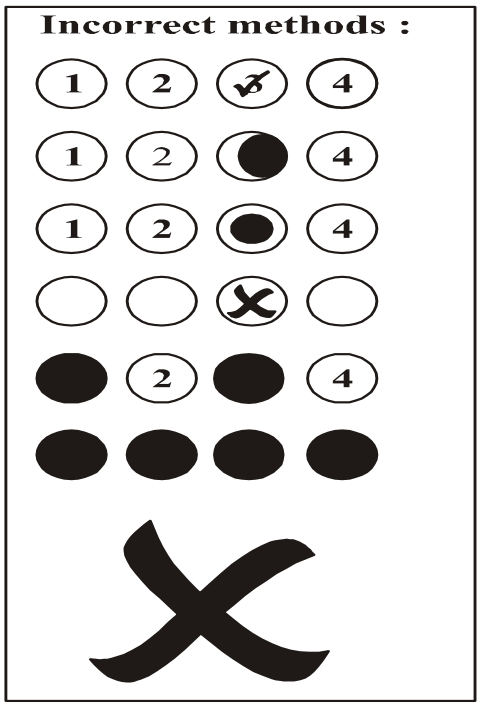
Question number 19 :

If correct option is 3, then

Correct method:



Incorrect methods :



PHYSICS

1. A particle of unit mass undergoes one – dimensional motion such that its velocity varies according to $v(x) = \beta x^{-2n}$, where β and *n* are constant and *x* is the position of the particle. The acceleration of the particle as a function of *x*, is given by

(a) $-2n\beta^2 x^{-4n-1}$
(b) $-2n\beta^2 x^{-n+1}$
(c) $-2n\beta^2 x^{-4n+1}$
(d) $-2n\beta^2 x^{-2n-1}$

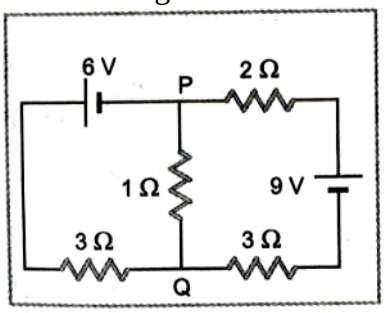
2. The moment of inertia of a solid sphere of density ρ and radius *R* about its diameter is :

(a) $\frac{105}{176}R^5\rho$ (b) $\frac{176}{105}R^5\rho$
(c) $\frac{105}{176}R^2\rho$ (d) $\frac{176}{105}R^2\rho$

3. Charge *Q* is distributed to two different metallic spheres having radii R and 2 R such that both spheres have equal surface charge density. Then charge on large sphere is

(a) $\frac{4Q}{5}$ (b) $\frac{Q}{5}$
(c) $\frac{3Q}{5}$ (d) $\frac{5Q}{5}$

4. In the circuit shown, the current in the 1 Ω resistor is Fig



(a) 1.3 from *P* to *Q*
(b) 0 *A*
(c) 0.13 A from *Q* to *P*
(d) 0.13 *A*, from *P* to *Q*

5. The refracting angle of a prism is A, the refractive index of the material of the prism is $\cot\left(\frac{A}{2}\right)$. The angle of minimum deviation is:

(a) 180° – 2 *A* (b) 90° – *A*
(c) 180° + 2 *A* (d) 180° – 3 *A*

6. A radioactive nucleus (initial mass number A and atomic number Z) emits 3 α - particles and 2 positrons. The ratio of number of neutrons to the of proton in the final nucleus will be

(a) $\frac{A-Z-4}{Z-8}$ (b) $\frac{A-Z-12}{Z-4}$
(c) $\frac{A-Z-4}{Z-2}$ (d) $\frac{A-Z-8}{Z-4}$

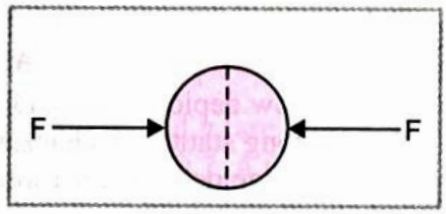
7. A bomb at rest explodes into three parts of the same mass. The moments of the two parts are -2 p î and p ĵ. The momentum of the third part will have a magnitude of :

(a) p (b) $\sqrt{3}p$
(c) $p\sqrt{5}$ (d) zero

8. From a solid sphere of mass M and radius R, a cube of maximum possible volume is cut. Moment of inertia of cube about an axis passing through its centre and perpendicular to one of its faces is

(a) $\frac{MR^2}{32\sqrt{2}\pi}$ (b) $\frac{MR^2}{16\sqrt{2}\pi}$
(c) $\frac{4MR^2}{9\sqrt{3}\pi}$ (d) $\frac{4MR^2}{3\sqrt{2}\pi}$

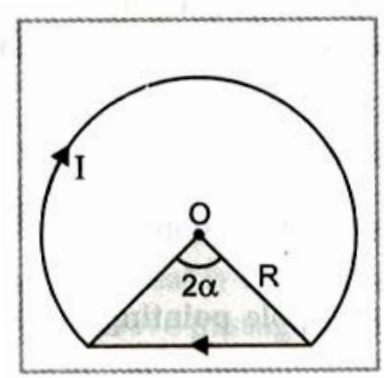
9. A uniformly charged thin spherical shell of radius R carries uniform surface charge density of σ per unit area. It is made of two hemispherical shells, held together by pressing them with force *F*, fig is proportional to



(a) $\frac{1}{\varepsilon_0}\sigma^2 R^2$ (b) $\frac{1}{\varepsilon_0}\sigma^2 R$

(c) $\frac{1}{\varepsilon_0}\frac{\sigma^2}{R}$ (d) $\frac{1}{\varepsilon_0}\frac{\sigma^2}{R^2}$

10. The magnetic field intensity due to a thin wire carrying current *I* shown in Fig is



(a) $\frac{\mu_0 I}{2\pi R}[\pi - \alpha + \tan\alpha]$

(b) $\frac{\mu_0 I}{2\pi R}[\pi - \alpha]$

(c) $\frac{\mu_0 I}{2\pi R}[\pi + \alpha]$

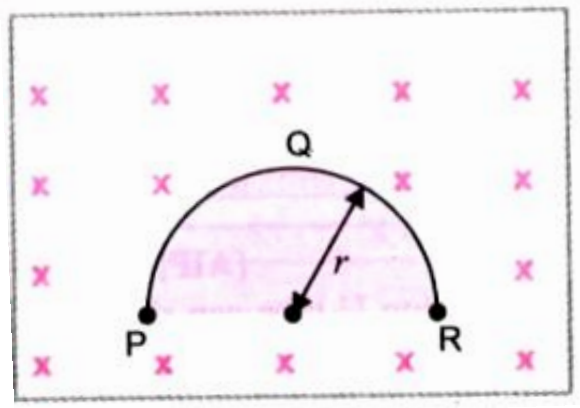
(d) $\frac{\mu_0 I}{2\pi R}[\pi + \alpha - \tan\alpha]$

11. In a uniform magnetic field of induction *B*, a wire in the form of semicircle of radius r rotates about the diameter of the circle with angular frequency ω. The axis of rotation is perpendicular to the field. If the total resistance of the circuit is *R*, then the mean power generated per period of rotation is

(a) $\frac{B\pi r^2 \omega}{2R}$ (b) $\frac{(B\pi r^2 \omega)^2}{16R}$

(c) $\frac{(B\pi r \omega)}{2R}$ (d) $\frac{(B\pi r^2 \omega)^2}{8R}$

12. A thin semicircular conducting ring (*PQR*) of radius r is falling with its plane vertical in a horizontal magnetic field B, as shown in Fig The potential difference developed across the ring its speed is v, is



(a) Zero

(b) $B\ v\ \pi r^2/2$ and *P* is at higher potential

(c) $\pi\ r\ B\ v$ and *R* is at higher potential

(d) $2\ r\ Bv$ and R is at higher potential.

13. The densities of two sphere A and B of same radii R vary with radial distance r as $\rho_A(r) = K\left(\frac{r}{R}\right)$ and $\rho_B(r) = K\left[\frac{r}{R}\right]^5$. respectively, where *k* is a constant. The moments of inertia of the individual spheres about axes passing through their centers are I_A and I_B respectively. If $\frac{I_B}{I_A} = \frac{n}{10}$, the value of n is

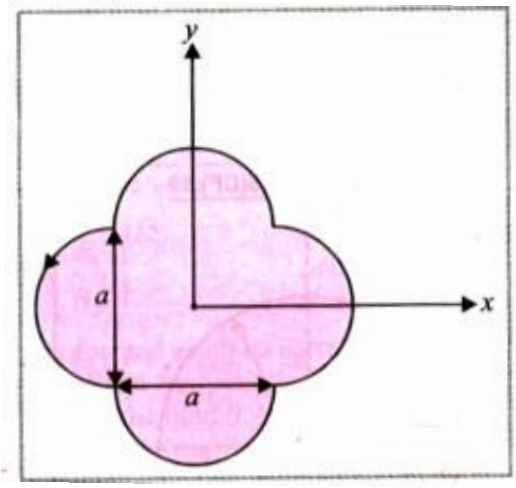
(a) 6

(b) 10

(c) 16

(d) 7

14. A loop carrying current I lies in the *x-y* plane as shown in the Fig The unit vector $\hat{k}$ is coming out of the plane of the paper. The magnetic moment of the current loop is



(a) $a^2 I\,\hat{k}$ (b) $\left(\frac{\pi}{2}+1\right)a^2 I\,\hat{k}$

(c) $-\left(\frac{\pi}{2}+1\right)a^2 I\,\hat{k}$ (d) $(2\pi+1)a^2 I\,\hat{k}$

15. The focal length of a thin biconvex lens is 20 cm. When an object is moved from a distance of 25 cm in front of it to 50 cm, the magnification of its image changes from m_{25} to m_{50}. The ratio $\frac{m_{25}}{m_{50}}$ is

(a) 4
(b) 6
(c) 1
(d) 3

CHEMISTRY

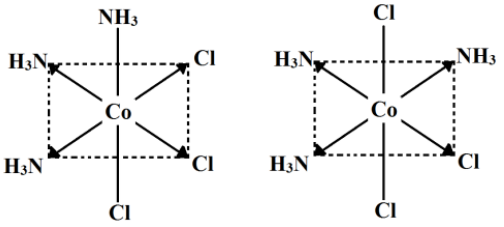
16. Which of the following molecules is planar?

(a) SF_4 (b) XeF_4
(c) NF_3 (d) SiF_4

17. The number of electrons involved in the conversion of MnO_4^- to MnO_2 is

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

18. Two isomers of a compound $Co(NH_3)_3Cl_3$ (MA_3B_3type) are shown in the figures.



The isomers can be classified as

(a) (i) *f*ac-isomers (ii) *mer*-isomer
(b) (i) optical-isomer (ii) *trans*-isomer
(c) (i) *mer*-isomer (ii) *f*ac-isomers
(d) (i) *trans*-isomer (ii) *cis*-isomer.

19. $CH_3CH_2CH_2Br \xrightarrow[\text{alcohol}]{\text{KOH}} CH_3CH{=}CH_2$

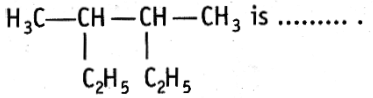
The above reaction is an example of ……. reaction.

(a) substitution
(b) elimination
(c) addition
(d) rearrangement

20. Paracetamol is used as an

(a) antibiotic (b) antimalarial
(c) antipyretic (d) arsenical

21. Correct IUPAC name for



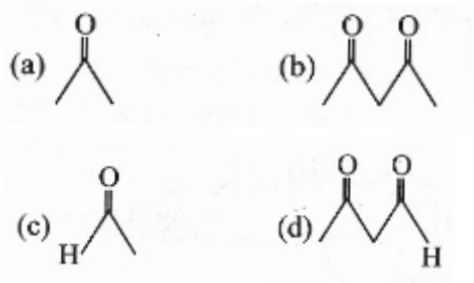
is .....

(a) 2-Ethyl-3-methylpentane
(b) 3, 4-Dimethylhexane
(c) 2-sec-Butylbutane
(d) 2, 3-Dimethyl butane

22. The ratio of kinetic energy and potential energy of an electron in any orbit is equal to

(a) 0 (b) $-\frac{1}{2}$
(c) –2 (d) ∞

23. Maximum enol content is in:



24. Relative lowering of vapour pressure of a dilute solution is 0.2. What is the mole fraction of the non-volatile solute?

(a) 0.8 (b) 0.5
(c) 0.3 (d) 0.2

25. For the reaction $4NH_3 + 5O_2 \rightarrow 4NO + 6H_2O$, if the rate of disappearance of NH_3 is 3.6×10^{-3} mol $L^{-1}s^{-1}$, what is the rate of formation of H_2O?

(a) 5.4×10^{-3} mol $L^{-1}s^{-1}$
(b) 3.6×10^{-3} mol $L^{-1}s^{-1}$
(c) 4×10^{-4} mol $L^{-1}s^{-1}$
(d) 0.6×10^{-4} mol $L^{-1}s^{-1}$

26. Milk is a colloid in which a

(a) liquid is dispersed in a liquid
(b) solid is dispersed in a liquid
(c) gas is dispersed in a liquid
(d) sugar is dispersed in a liquid

27. Which one of the following noble gases is the least polarizable

(a) Xe
(b) Ar
(c) Ne
(d) He

28. When a substance (A) react with water it produces a combustible gas (B) and a solution

of substance (C) in water. When another substance (D) reacts with this solution of (C), it also produces the same gas (B) on warming but (D) can produce gas (B) on reaction with dilute sulphuric acid at room temperature. Substance (A) imparts a deep golden yellow colour to a smokeless flame of Bunsen burner. Then (A), (B), (C) and (D) respectively are

(a) CaH_2, $Ca(OH)_2$, Sn

(b) K, H_2, KOH, Al

(c) Na, H_2, NaOH, Zn

(d) CaC_2, C_2H_2, $Ca(OH)_2$, Fe

29. NaCN is sometime added in the froth floatation process as a depressant, when ZnS and PbS mineral are extracted because

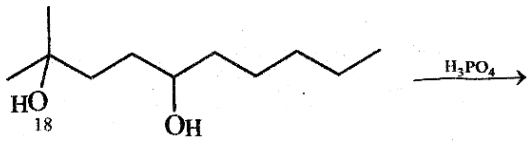
(a) Zns forms soluble complex $Na_2[Zn(CN)_4]$ while PbS forms froth

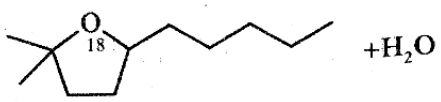
(b) $Pb(CN)_2$ is precipitated while no effect on ZnS

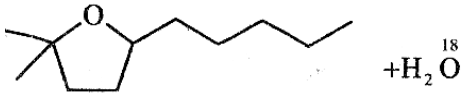
(c) PbS forms soluble complex $Na_2[Pb(CN)_4]$ while ZnS forms froth

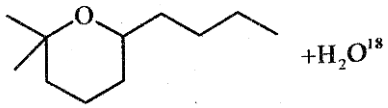
(d) NaCN is never added in froth floatation process

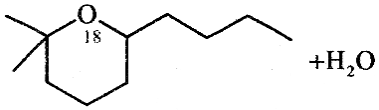
30. Consider the following diol which has one 2° alcoholic group and one 3° alcoholic group. 3° alcoholic group is isotopically labeled with O^{18} as shown. Identify the products when it is dehydrated with H_3PO_4.



(a) 

(b) 

(c) 

(d) 

MATHEMATICS

31. For real number x and y, we write xRy $\Leftrightarrow$ x - y + $\sqrt{2}$ is an irrational number. Then the relation R is

(a) Reflexive (b) Symmetric

(c) Transitive (d) None of these

32. The interior angles of polygon are in A.P if the smallest angle be 120° and the common difference be 5°, then the number of sides of the polygon

(a) 8 (b) 10

(c) 9 (d) 6

33. If $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ a & b & -1 \end{bmatrix}$, then $A^2 =$

(a) Unit matrix (b) Null matrix

(c) A (d) -A

34. The value of $\cos^2 48^\circ - \sin^2 12^\circ$ is

(a) $\frac{\sqrt{5}+1}{8}$ (b) $\frac{\sqrt{5}-1}{8}$

(c) $\frac{\sqrt{5}+1}{5}$ (d) $\frac{\sqrt{5}+1}{2\sqrt{2}}$

35. $\cos(\tan^{-1}x)$ =

(a) $\sqrt{1+x^2}$ (b) $\frac{1}{\sqrt{1+x^2}}$

(c) $1 + x^2$ (d) None of these

36. The area of the triangle, whose vertices (1, 0), (7, 0) and (4, 4) is

(a) 8 (b) 10

(c) 12 (d) 14

37. The equation of line through (3, -4) and perpendicular to the line 3x + 4y = 5 is

(a) 4x + 3y = 24

(b) y – 4 = (x + 3)

(c) 3y – 4x = 24

(d) $y + 4 = \frac{4}{3}(x - 3)$

38. If the line x + 2by + 7 = 0 is a diameter of the circle $x^2 + y^2 - 6x + 2y = 0$, then b =

(a) 3 (b) -5

(c) -1 (d) 5

39. The directrix of the hyperbola is $\frac{x^2}{9} - \frac{y^2}{4} = 1$

(a) $x = 9/\sqrt{13}$ (b) $y = 9/\sqrt{13}$

(c) $x = 6/\sqrt{13}$ (d) $y = 6/\sqrt{13}$

40. If the vectors $2\hat{i} - 3\hat{j}$, $\hat{i} + \hat{j} - \hat{k}$ and $3\hat{i} - \hat{k}$ form three concurrent edges of a parallelopiped, then the volume of the parallelopiped is

(a) 8 (b) 10

(c) 4 (d) 14

41. The shortest distance between the lines $\frac{x-3}{3} = \frac{y-8}{-1} = \frac{z-3}{1}$ and $\frac{x+3}{-3} = \frac{y+7}{2} = \frac{z-6}{4}$ is

(a) $\sqrt{30}$ (b) $2\sqrt{30}$

(c) $5\sqrt{30}$ (d) $3\sqrt{30}$

42. $\lim_{\theta \to 0} \frac{\tan x - \sin x}{x^3} =$

(a) 1/2 (b) -1/2

(c) 2/3 (d) none of these

43. Let $h(x) = f(x) - (f(x))^2 + (f(x))^3$ for every real number x. then

(a) h is increasing whenever f is increasing

(b) h is increasing whenever f is decreasing

(c) h is decreasing whenever f is increasing

(d) Nothing can be said in general

44. If $I_n = \int_0^{\pi/4} \tan^n\theta \, d\theta$, then $I_8 + I_6$ equals

(a) $\frac{1}{4}$ (b) $\frac{1}{5}$

(c) $\frac{1}{6}$ (d) $\frac{1}{7}$

45. The value of $\int_{\sqrt{\ln 2}}^{\sqrt{\ln 3}} \frac{x \sin x^2}{\sin x^2 + \sin(\ln 6 - x^2)} dx$ is

(a) $\frac{1}{4} \ln \frac{3}{2}$ (b) $\frac{1}{2} \ln \frac{3}{2}$

(c) $\ln \frac{3}{2}$ (d) $\frac{1}{6} \ln \frac{3}{2}$

ANSWER KEY

PHYSICS

1	**A**	**11**	**D**
2	**B**	**12**	**D**
3	**A**	**13**	**A**
4	**C**	**14**	**B**
5	**A**	**15**	**B**
6	**A**		
7	**C**		
8	**C**		
9	**A**		
10	**A**		

CHEMISTRY

16	**B**	**26**	**A**
17	**A**	**27**	**D**
18	**A**	**28**	**C**
19	**B**	**29**	**A**
20	**C**	**30**	**B**
21	**B**		
22	**B**		
23	**B**		
24	**D**		
25	**A**		

MATHEMATICS

31	**A**	**41**	**D**
32	**C**	**42**	**A**
33	**A**	**43**	**A**
34	**A**	**44**	**D**
35	**B**	**45**	**A**
36	**C**		
37	**D**		
38	**D**		
39	**A**		
40	**C**		