

Amrita VISHWA VIDYAPEETHAM

(University established u/s 3 of UGC Act 1956)

Amrita Entrance Examination – Engineering 2015

PHYSICS, CHEMISTRY & MATHEMATICS

Question Booklet Version Code	A	Question Booklet No.		Time: 2½ Hrs
Number of Pages	20	Number of Questions	100	Max. Marks: 300
Name of the Candidate				
Registration Number				
Signature of the Candidate				

INSTRUCTIONS TO THE CANDIDATES

GENERAL

- Any malpractice or attempt to commit malpractice in the examination hall will lead to disqualification of the candidate.
- Candidates are not allowed to carry any textual material, printed or written bits of paper, Mathematical and Physical Tables, Electronic gadgets like tablet, calculator, cell phone, etc. into the examination hall.
- Candidates shall possess the Amrita Entrance Examination – Engineering 2015 Hall Ticket which should be produced on demand.
- Candidates shall occupy the respective seats bearing their registration numbers.
- Candidates shall sign the attendance sheet available with the invigilator.
- Candidates are not permitted to leave the hall before the end of the examination.**
- Candidates are required to handover the ANSWER SHEET and the QUESTION BOOKLET to the invigilator before leaving the hall.**
- After submitting the answer sheet, candidates are required to affix their left thumb impression on the attendance sheet available with the invigilator.**

QUESTION BOOKLET

9. **DO NOT OPEN THIS SEALED BOOKLET UNTIL THE INVIGILATOR ANNOUNCES TO DO SO.**
10. **Before opening the Question Booklet,** write the Name, Registration Number and Signature using ball pen in the space provided at the top of this page.
11. **Immediately after opening the booklet,** examine whether it contains all the 100 questions in serial order and 20 pages as mentioned at the top of this page. In case of unprinted, torn or missing pages, the matter should be reported to the invigilator immediately.
12. Rough work may be done on the space provided in this booklet.

(Continued on the last page)

Space for rough work

PHYSICS

1. The electric current in a circuit is given by $I = I_0 \sin (\omega t + \theta)$. What is the dimension of θ ?
a) second
b) 1/second
c) meter / second
d) dimensionless
2. The velocity varies with time according to the relation, $v = 3t + 4$. The distance travelled by the body in $t = 2$ s will be
a) 10 m
b) 12 m
c) 14 m
d) 16 m
3. When a projectile is at the highest point on its trajectory, the potential and kinetic energies are respectively
a) maximum and minimum
b) minimum and zero
c) zero and maximum
d) maximum and zero
4. A block of mass 2 kg starts moving when the angle of inclination of the inclined plane is 60° . If the coefficient of kinetic friction is 0.6, the frictional force is
a) 2 N
b) 1 N
c) 4 N
d) 0.5 N
5. Two forces $F_1 = (7\mathbf{i} + 2\mathbf{j})$ N and $F_2 = (-5\mathbf{i} + 3\mathbf{j})$ N act on a particle. The third force F_3 that should act on the particle to make it move with constant velocity is
a) $(2\mathbf{i} + 5\mathbf{j})$ N
b) $(-2\mathbf{i} - 5\mathbf{j})$ N
c) $(-2\mathbf{i} + 5\mathbf{j})$ N
d) $(2\mathbf{i} - 5\mathbf{j})$ N
6. Two satellites of masses $3M$ and M orbit the earth in circular orbits of radii r and $3r$ respectively. The ratio of their speeds is
a) 1 : 1
b) $\sqrt{3}$: 1
c) 3 : 1
d) 9 : 1
7. In an adiabatic process, the pressure of a gas is proportional to the cube of its absolute temperature. The value of γ (which equals C_p/C_v) is
a) 5/4
b) 4/3
c) 5/3
d) 3/2

Space for rough work

CHEMISTRY

31. The actual atomic weight of an element is represented in
a) number
b) "u"
c) "amu"
d) "mu"
32. The weight of nascent oxygen in milligrams obtained from 6.32 g of potassium permanganate (Molecular weight 158) in acid medium is
a) 16
b) 0.016
c) 0.16
d) 1.6
33. The value of Plank's constant in units of Js is
a) 6.626×10^{-34}
b) 6.626×10^{-23}
c) 6.626×10^{-27}
d) 1.38×10^{-23}
34. The mass of proton having a wavelength of $4.2\text{\AA}$ is
a) 4.78×10^{-33} kg
b) 4.78×10^{-33} g
c) 7.17×10^{-33} kg
d) 2.39×10^{-33} g
35. The measurement of a thermodynamic property known as temperature is based on
a) zeroth law of thermodynamics
b) first law of thermodynamics
c) second law of thermodynamics
d) kirchoffs equation
36. The bond dissociation enthalpies of $\text{H}_2(\text{g})$, $\text{Cl}_2(\text{g})$ and $\text{HCl}(\text{g})$ are 435, 243 and 431 kJ/mol respectively. The enthalpy of formation of $\text{HCl}(\text{g})$ in kJ/mol will be
a) 121
b) -1211
c) -121
d) -242
37. Defective coating of zinc over mild steel leads to
a) enhanced corrosion of mild steel
b) increase of corrosion potential
c) corrosion of zinc coating
d) hydrogen evolution over mild steel
38. What will happen to the rate constant of a reaction when the temperature is raised by 10°C ?
a) Increase by 10 times
b) Is halved
c) Is doubled
d) Not affected

Space for rough work

48. How many σ and π bonds are present in nitromethane

- a) 6 σ and 1 π
c) 6 σ and 2 π

49. Retardation factor is calculated as

- a) ratio between 'distance travelled by the substance from the base line and distance moved by the solvent from the base line'
- b) ratio between 'distance travelled by the solvent from the base line and distance moved by the substance from the base line'
- c) sum of 'distance travelled by the substance from the base line and distance moved by the solvent from the base line'
- d) difference of 'distance travelled by the substance from the base line and distance moved by the solvent from the base line'

50. In which one of the following, Mn exhibits its highest oxidation state?

- a) MnO_2
c) MnO_4^-

51. S_N1 reaction is favored by

- a) non polar solvents
b) more number of alkyl group on the carbon atom attached to the halogen atom
c) small groups on the carbon attached to the halogen atom
d) no groups on the carbon attached to the halogen atom

52. Phenol is less acidic than

- a) ethanol b) o-nitrophenol
c) o-methylphenol d) o-methoxyphenol

53. Chloro ethane reacts with compound Z to form diethyl ether. Identify Z?

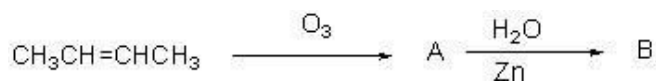
- a) NaOH
b) H₂SO₄
c) C₇H₅ONa
d) Na₂S₂O₃

54. Which of the following reagents may be used to distinguish between phenol and benzoic acid?

- a) Tollens' reagent
b) Molisch reagent
c) Neutral FeCl_3
d) Aqueous NaOH

Space for rough work

55. In the following sequence of reactions, the alkene affords the compound 'B'.



The compound B is

- | | |
|---------------------------------------|--|
| a) CH_3CHO | b) CH_3COCH_3 |
| c) $\text{CH}_3\text{CH}_2\text{CHO}$ | d) $\text{CH}_3\text{CH}_2\text{COCH}_3$ |

56. How many chiral carbons are there in β -D-(+)-glucose?

- | | |
|----------|---------|
| a) five | b) six |
| c) three | d) four |

57. Why are certain rubbers called as 'vulcanized rubber'?

- | |
|---|
| a) They are formed under volcanic eruption |
| b) They are prepared by adding 5% of sulphur as cross-linking agent |
| c) They do not use any co-monomer |
| d) By the addition of excessive co-monomer |

58. One of the common components of photochemical smog is

- | | |
|-----------------|------------------|
| a) formaldehyde | b) acetaldehyde |
| c) methane | d) CO_2 |

59. Sodium dodecylbenzenesulphonate refers to

- | | |
|-----------------------|-----------------------|
| a) anionic detergent | b) soap |
| c) cationic detergent | d) nonionic detergent |

60. Which one of the following acts as antihistamine?

- | | |
|---------------|---------------------|
| a) Equanil | b) Morphine |
| c) Serotonine | d) Bromophenylamine |

Space for rough work

MATHEMATICS

61. If a , b , c are AM, GM and HM respectively of two equal numbers, then
 a) $2b = a + c$
 b) $b = 2ac / (a+c)$
 c) $b^2 = ac$
 d) $ab^2 = c$
62. The harmonic mean of the roots of the equation is
 $(7 + \sqrt{3})x^2 - (6 + \sqrt{7})x + (12 + 2\sqrt{7}) = 0$
 a) 8
 b) 6
 c) 3
 d) 4
63. The general solution of x satisfying the system of equations $5^{(\sin x + \sin y)} = 1$; $25^{(\sin 2x + \sin 2y)} = 5$ is
 a) $n\pi \pm \pi/6$
 b) $2n\pi + \pi/6$
 c) $n\pi - (\pi/6)$
 d) $n\pi + \pi/6$
64. The angles of a triangle are in A.P and the least angle is 40° . The greatest angle in radians is
 a) $\pi/2$
 b) $4\pi/9$
 c) $\pi/4$
 d) $3\pi/2$
65. If $\sin \theta = 1/\sqrt{5}$ and $\tan \theta = 1/2$, then $\cos \theta$ is equal to
 a) $2/\sqrt{5}$
 b) $1/\sqrt{3}$
 c) $1/\sqrt{5}$
 d) $1/(2\sqrt{5})$

Space for rough work

d) $e^{1/4}$

d) $(3, 0)$

d) $y - 1 = 2x$

d) 2 BA

d) -4

d) $13b^2 + 6ac = 0$

Space for rough work

75. The equation of the plane through the intersection of the planes $2x - y + z = 6$ and $x + y + 2z = 7$ and passing through the point $(1, 1, 1)$ is

- a) $2x - 7y - 5z + 10 = 0$ b) $2x - 7y + 5z + 10 = 0$
 c) $2x - 7y - 5z - 10 = 0$ d) $2x + 7y - 5z - 10 = 0$

76. The equation of the line passing through the point $(1, 1, 0)$ and parallel to the plane $3x + 2y + z = 5$ is

- a) $\frac{x-1}{-3} = \frac{y-1}{-2} = \frac{z}{1}$ b) $\frac{x+1}{3} = \frac{y+1}{2} = \frac{z}{1}$
 c) $\frac{x-1}{3} = \frac{y-1}{2} = \frac{z}{1}$ d) $\frac{x-3}{1} = \frac{y-2}{1} = \frac{z-1}{0}$

77. The angle between the complex numbers $2 + 2i$ and -7 is

- a) $\pi/2$ b) $\pi/4$
 c) $3\pi/2$ d) $3\pi/4$

78. What is the value of $4 + 5\left(-\frac{1}{2} + i\frac{\sqrt{3}}{2}\right)^{334} + 3\left(-\frac{1}{2} + i\frac{\sqrt{3}}{2}\right)^{365}$?

- a) i b) $\frac{\sqrt{3}}{2}$
 c) $\frac{\sqrt{3}}{2}i$ d) $\sqrt{3}i$

Space for rough work

84. The equation $4x^2 + 7y^2 + 32x - 56y + 148 = 0$ represents
- a) an ellipse with center (4, -4)
 - b) an ellipse with center (-4, 4)
 - c) an ellipse with center (2, -2)
 - d) an ellipse with center (-2, 2)
85. The equation for the circle obtained by shifting the circle $x^2 + y^2 = 49$ to 3 units down and 2 units left is:
- a) $(x+3)^2 + (y+2)^2 = 49$
 - b) $(x-3)^2 + (y-2)^2 = 49$
 - c) $(x-2)^2 + (y-3)^2 = 49$
 - d) $(x+2)^2 + (y+3)^2 = 49$
86. The variance of a data set is k , then the variance of the data set obtained by shifting the original data to 3 units is
- a) $k - 3$
 - b) $k + 3$
 - c) k
 - d) $3k$
87. Suppose that $P(A/B) = 0.7$, $P(A) = 0.5$ and $P(B) = 0.2$ then $P(B/A)$ is,
- a) 0.14
 - b) 0.4
 - c) 0.3
 - d) 0.28

Space for rough work

(continued from the first page)

OMR ANSWER SHEET

13. Use the OMR answer sheet carefully; no spare sheet will be issued under any circumstance.
14. Do not fold or make any stray mark on the OMR sheet.
15. Use HB Pencil or Black ball point pen for shading the bubbles and ball point pen for writing.
16. In the OMR answer sheet, make the following entries
 - a. Write the Registration Number, Question Booklet Number and Question Booklet Version code using ball point pen.
 - b. Fill the ovals corresponding to the Registration Number, Question Booklet Number and Question Booklet Version Code using HB pencil / ball point pen.
 - c. Write your Name and Signature using ball point pen.
17. Rough work should not be done on the answer sheet.

ANSWERING AND EVALUATION

18. For each question, four answers are suggested of which only one is correct / most appropriate. Mark the correct / most appropriate answer by darkening the corresponding bubble using HB pencil or Blue / Black ball point pen.
19. In case the candidate wishes to change the choice already shaded using HB pencil, he/she may erase the marking completely and thereafter shade the alternative bubble. If ball point pen is used for shading the ovals, make sure of the answer before shading since such markings cannot be altered.
20. If more than one bubble is darkened against a question, it will be treated as an incorrect answer.
21. For each correct answer, three marks will be awarded.
22. **For each incorrect answer, one mark will be deducted from the total score.**
23. If any smudge is left on the OMR sheet, evaluation will become imperfect.