

PRACTICE PAPER

CHEMISTRY

Q1

Fructose and glucose when covalently linked form

- (a) Cellobiose
- (b) Sucrose
- (c) Maltose
- (d) Lactose

Q2

How can you separate camphor from a mixture of caffeine and camphor?

- (a) By distillation
- (b) By evaporation
- (c) By differential extraction
- (d) By sublimation

Q3

The amino group of an aryl amine may be replaced by a 'H' upon reaction of its diazonium salt with

- (a) H_2SO_4
- (b) HCl
- (c) HNO_3
- (d) H_3PO_2

Q4

Iodoform may be obtained by the reaction of aldehydes with

- (a) I_2
- (b) KI-NaOH
- (c) I_2-NaOH
- (d) NaI-NaOH

Q5

A silver mirror is formed during reaction of aldehydes with

- (a) AgNO_3
- (b) Ag_2O
- (c) AgOH
- (d) $[\text{Ag}(\text{NH}_3)_2]^+$

Q6

Which of the following exhibits inert-pair effect?

- (a) Boron
- (b) Aluminium
- (c) Scandium
- (d) Thallium

Q7

The ion present in Nessler's reagent is

- (a) Hg^+
- (b) Hg^{2+}
- (c) HgI_2^{2-}
- (d) HgI_4^{2-}

Q8

The IUPAC name of $\text{Na}_3 [\text{Co}(\text{NO}_2)_6]$ is

- (a) Sodium hexanitrito cobaltate (III)
- (b) Sodium cobaltinitrite
- (c) Sodium hexanitrocobaltate (III)
- (d) Sodium cobalt hexanitrite

Q9

Ziegler Natta catalyst is an organometallic compound of

- (a) Iron
- (b) Zirconium
- (c) rhodium
- (d) titanium

Q10

Phosphorous trioxide (P_4O_6) is heated with water to give

- (a) hypophosphorous acid
- (b) phosphorous acid
- (c) hypophosphoric acid
- (d) orthophosphoric acid

Q11

Amongst the elements of the following electronic configurations, the one having highest ionization energy is

- (a) $[\text{Ar}] 3d^{10} 4s^2 4p^3$
- (b) $[\text{Ne}] 3s^2 3p^3$
- (c) $[\text{Ne}] 3s^2 3p^2$
- (d) $[\text{Ne}] 3s^2 3p^1$

Q12

The number and types of bonds between two carbon atoms in CaC_2 are

- (a) one sigma (s) and one pi (p) bond
- (b) one sigma (s) and two pi (p) bonds
- (c) one sigma and one and a half pi bonds
- (d) one sigma and no pi bond

Q13

Which of the following has no S-S bond?

- (a) $\text{S}_2\text{O}_4^{2-}$
- (b) $\text{S}_2\text{O}_5^{2-}$
- (c) $\text{S}_2\text{O}_3^{2-}$
- (d) $\text{S}_2\text{O}_7^{2-}$

Q14

The volume strength of 1.5 N H_2O_2 solution is

- (a) 4.8
- (b) 8.4
- (c) 3.0
- (d) 8.0

Q15

Which of the following compounds is formed in solution when gold is dissolved in aqua regia?

- (a) Au_2O_3
- (b) HAuCl_4
- (c) AuCl_3
- (d) $\text{Au}(\text{NO}_3)_3$

Q16

Which of the following salts is used in medicine as an antacid?

- (a) Na_2SO_4
- (b) NaHCO_3
- (c) NaCl
- (d) NaNO_2

Q17

The highest boiling point is expected for

- (a) Isooctane
- (b) N-octane
- (c) 2, 3, 3, 3- Tetramethylbutane
- (d) n – Butane

Q18

Isopropyl bromide on Wurtz reaction gives

- (a) Hexane
- (b) Propane
- (c) 2, 3- Dimethylbutane
- (d) Neohexane

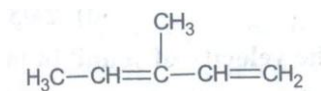
Q19

In the reaction, $\text{C}_6\text{H}_5\text{CH}_3 \xrightarrow{\text{Oxidation}} \text{A} \xrightarrow{\text{Oxidation}} \text{A} \xrightarrow{\text{NaOH}} \text{B} \xrightarrow{\text{sodaime}} \text{C}$, the product C is

- (a) $\text{C}_6\text{H}_5\text{OH}$
- (b) C_6H_6
- (c) $\text{C}_6\text{H}_5\text{COONa}$
- (d) $\text{C}_6\text{H}_5\text{ONa}$

Q20

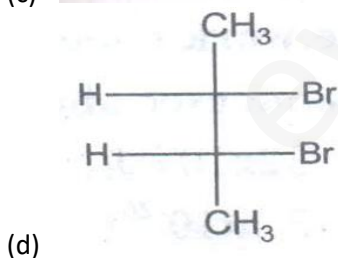
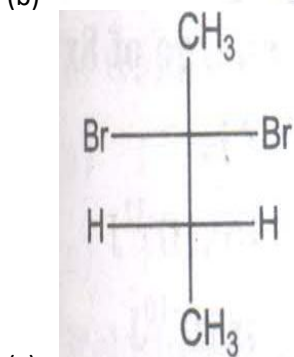
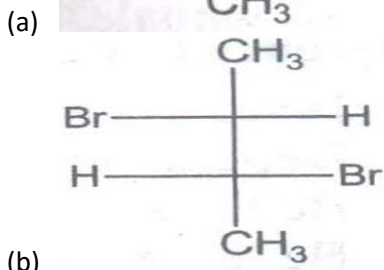
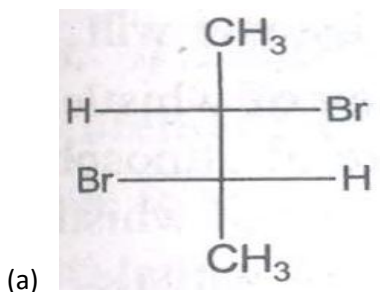
Which set of products is expected on reductive ozonolysis of the following diolefin?



- (a) $(\text{CH}_3\text{CHO}, \text{CH}_3\text{CH}_2\text{COCH}=\text{CH}_2)$
- (b) $\text{CH}_3\text{CH}=\text{C}(\text{CH}_3)\text{CHO} : \text{CH}_2\text{O}$
- (c) $\text{CH}_3\text{CHO} ; \text{CH}_3\text{COCHO} : \text{CH}_2\text{O}$
- (d) $\text{CH}_3\text{CHO} : \text{CH}_3\text{COCH}_3 : \text{CH}_2\text{O}$

Q21

Trans-2-butene + Br₂ given



Q22

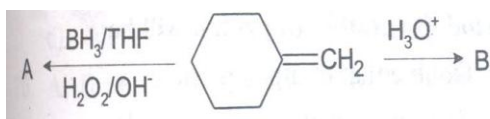
The name of the compound is :

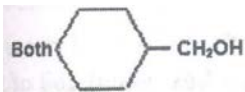
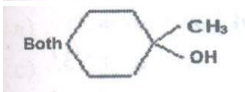
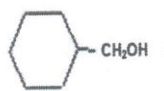
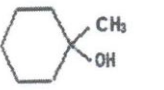
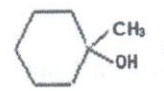
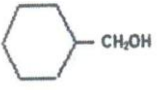


- (a) (2Z, 4Z)-2, 4 – hexadiene
- (b) (2Z, 4E)-2, 4 – hexadiene
- (c) (2E, 4Z) -2, 4 – hexadiene
- (d) (2E, 4E)-2, 4 – hexadiene

Q23

A and B in the following reactions are

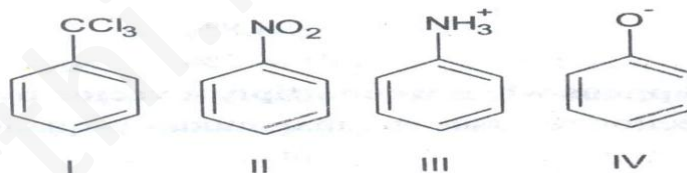


- (a) Both 
- (b) Both 
- (c)  and 
- (d)  and 

Q24

Electrophile NO_2 attacks the following :

In which cases NO_2 will be at meta-position?



- (a) II and IV
 (b) I, II and III
 (c) II and III only
 (d) I only.

Q25

To manufacture aluminium metal, alumina is generally reduced

- (a) with carbon
 (b) with magnesium
 (c) electrolytically
 (d) with CO

Q26

Which of the following is an anionic detergent:

- (a) Trimethylstearyl ammonium chloride
 (b) Sodium p-dodecylbenzene sulphonate
 (c) Sodium stearate
 (d) All of these

Q27

Which of the following is detected by the flame test:

- (a) NH_4^+
- (b) K^+
- (c) Mg^{2+}
- (d) Al^{3+}

Q28

The radiation responsible for global warming and Ozone depletion are respectively:

- (a) UV & IR
- (b) UV & UV
- (c) IR & IR
- (d) IR & UV

Q29

Ammonium dichromate is used in some fireworks. The green colored powder blown in the air is

- (a) CrO_3
- (b) Cr_2O_3
- (c) Cr
- (d) Cr_2O_7

Q30

Complete Hydrolysis of cellulose gives:

- (a) L-glucose
- (b) D-glucose
- (c) D-ribose
- (d) All of these

PHYSICS**Q1**

One kg of water is evaporated from 6 kg of sea water containing 4% salt. The percentage of salt left out in sea water is

- (a) 8.4%
- (b) 4.8%
- (c) 2.4%
- (d) 4.2%

Q2

What happens when we multiply a vector by -4?

- (a) Direction reverses and magnitudes is quadrupled
- (b) Direction reverses and unit changes
- (c) Direction remains unchanged but unit changes
- (d) Neither direction reverses nor unit changes. Only the magnitude is quadrupled.

Q3

Two cyclists are on a parallel track. Cyclist P is faster than cyclist Q. The cyclists exchange packets of equal masses.

- (a) P will be retarded but Q will be accelerated
- (b) Q will be retarded but P will be accelerated
- (c) Both will continue to move as they were moving
- (d) Any of two can retard or accelerate

Q4

The geometrical shape of curve between kinetic energy and speed is

- (a) A straight line
- (b) Circle
- (c) Ellipse
- (d) Parabola

Q5

A top spins with an angular velocity of 20 rad s^{-1} with a moment of inertia I . If the velocity changes to half, the new moment of inertia will be

- (a) $I/3$
- (b) $3I$
- (c) $I/2$
- (d) $2I$

Q6

Principle of superposition is valid for

- (a) Gravitational force
- (b) Nuclear force
- (c) Both gravitational and nuclear forces
- (d) Nuclear force when gravitational force is ignored.

Q7

Young's modulus for a perfectly plastic body is

- (a) Zero
- (b) Infinite
- (c) 1
- (d) Finite

Q8

A Carnot's engine is made to work between 200°C and 0°C first and then between 0°C and -200°C . The ratio of efficiencies of the engine is

- (a) 1.73: 1
- (b) 1: 1.73
- (c) 1 : 1
- (d) 1 : 2

Q9

A monoatomic gas is suddenly compressed to $1/8^{\text{th}}$ of its initial volume adiabatically. The ratio of its final pressure to initial pressure is ($\gamma = 5/3$)

- (a) $40/3$
- (b) 32
- (c) 8
- (d) $24/5$

Q10

If V_m is the velocity of sound in moist air, V_d is the velocity of sound in dry air then under identical conditions of pressure and temperature

- (a) $V_m V_d = 1$
- (b) $V_m = V_d$
- (c) $V_m < V_d$
- (d) $V_m > V_d$

Q11

A train is approaching a stationary listener on a railway platform and the train whistles. The apparent frequency of whistle heard by listener will

- (a) Be more than the frequency of whistle
- (b) Depend on the temperature of atmosphere
- (c) Be the same as the frequency of whistle
- (d) Be less than the frequency of whistle

Q12

The work done in placing a charge of 8×10^{18} C on a condenser of capacity $100 \mu\text{F}$ is

- (a) 32×10^{-32} J
- (b) 16×10^{-32} J
- (c) 3.1×10^{-26} J
- (d) 4×10^{-10} J

Q13

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

- (a) $4R$
- (b) $R/16$
- (c) R
- (d) $R/4$

Q14

An alpha particle and a proton have same velocity when they enter a uniform magnetic field. The period of rotation of proton will be

- (a) Double that of alpha particle
- (b) Four times that of alpha particle
- (c) One half times that of alpha particle
- (d) Same as that of alpha particle

Q15

A current is flowing in a hexagonal coil of side l . The magnetic field at centre of this coil is

- (a) $\mu_0 i / 4\pi l$
- (b) $\pi \mu_0 i \sqrt{3} l$
- (c) zero
- (d) $\sqrt{3} \mu_0 i / \pi l$

Q16

In an a.c. circuit, V and I are given by

$$V = 100 \sin (100t) \text{ Volt and}$$

$$I = 100 \sin (100t + \pi/3) \text{ mA. The power dissipated in the circuit will be}$$

- (a) 10^4 W
- (b) 10 W
- (c) 2500 W
- (d) 5 W

Following question consists of two statements printed as Statement 1 and Statement 2. While answering these questions you are required to select any one of the responses indicated as

1. If both Statement 1 and Statement 2 are true and Statement 2 is a correct explanation of Statement 1.
2. If both Statement 1 and Statement 2 are true but the Statement 2 is not a correct explanation of Statement 1.
3. If Statement 1 is true but the Statement 2 is false.
4. If Statement 1 is false but Statement 2 is true.

Q17

Statement 1: For an actual transformer, $\eta \neq 100\%$ due to some energy losses

Statement 2: Transformer is an economical device to transmit electric power to long distances.

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

Q18

Relation between average energy density of the electric field and the average energy density of the magnetic field is

- (a) $U_E = 2U_B$
- (b) $U_E = U_B$
- (c) $U_B = 2U_E$
- (d) U_E and U_B are independent of each other

Q19

Color of light having maximum speed in air is

- (a) Blue
- (b) Violet
- (c) Yellow
- (d) Red

Q20

A, B and C are three optical media of respective critical angles, C_1 , C_2 and C_3 . Total internal reflection of light can occur from A to B and also from B to C but not from C to A. Then the correct relation between the critical angles is

- (a) $C_1 > C_2 > C_3$
- (b) $C_1 = C_2 = C_3$
- (c) $C_3 > C_1 > C_2$
- (d) $C_1 < C_2 < C_3$

Q21

Increase in temperature of an optic medium results into

- (a) No change in its refractive index.
- (b) Increase of refractive index of the medium
- (c) Decrease in refractive index of the medium
- (d) Any of these

Q22

In a Millikan's oil drop experiment, a drop of charge Q and radius r is kept constant between two plates of potential difference of 800 V. The charge on other drop of radius $2r$ which is kept constant with a potential difference of 3200V is

- (a) $Q/2$
- (b) $2Q$
- (c) $4Q$
- (d) $Q/4$

Q23

Fertile material among the following is

- (a) Pu^{230}
- (b) U^{233}
- (c) U^{238}
- (d) U^{235}

Q24

Whenever a hydrogen atom emits a photon in the Balmer series

- (a) It need not emit any more photon
- (b) It may emit another photon in the paschen series
- (c) It must emit another photon in the Lyman series
- (d) It may emit another photon in the Balmer series

Q25

At 0 K temperature, a p-type semiconductor

- (a) Has a few holes but no free electrons
- (b) Does not have any charge carriers
- (c) Has few holes and few free electrons
- (d) Has equal number of holes and free electrons

Q26

The TV transmission tower at a particular station has a height of 160 m. The coverage range is about

- (a) 4600 km^2
- (b) 6400 km^2
- (c) 3400 km^2
- (d) 8400 km^2

Q27

Q cylindrical tube, open at both ends, has a fundamental frequency f in air. The tube is dipped vertically in water so that half of its length is in water. The fundamental frequency of the air column is now

- (a) $f/2$
- (b) $3f/4$
- (c) F
- (d) $2f$

Q28

If elements with principal quantum number $n > 4$ were not allowed in nature, the number of possible elements would be

- (a) 60
- (b) 32
- (c) 4
- (d) 64

Read the following statement carefully

Statement 1: The resistivity of semiconductor decreases with increase of temperature

Statement 2: In a conducting solid, the rate of collisions between free electrons and ions increases with increases of temperature

Q29

Select the correct answer from the following

- (a) S1 is true but S2 is false
- (b) S1 is false but S2 is true
- (c) Both S1 and S2 are true
- (d) S1 is true and S2 is the correct reason for S1

Q30

An alpha particle of energy 5 MeV is scattered through 180° by a fixed uranium nucleus. The distance of closest approach is of the order of

- (a) 1 \AA
- (b) 10^{-10} cm
- (c) 10^{-12} cm
- (d) 10^{-15} cm

MATHEMATICS**Q1**

If $|z - i \operatorname{Re}(z)| = |z|$, then z lies on

- (a) $\operatorname{Re}(z) = 2\operatorname{Im}(z)$
- (b) $\operatorname{Re}(z) = 0$
- (c) $\operatorname{Im}(z) = 0$
- (d) $\operatorname{Re}(z) + \operatorname{Im}(z) = 1$

Q2

The real roots of the equation $3^{\log_3(x^2 - 6x + 8)} = -2(x - 2)$

- (a) 1 and 2
- (b) 2 and 2
- (c) 2 and 8
- (d) 3 and 4

Q3

If positive numbers a^{-1} , b^{-1} , c^{-1} are in A.P., then the product of roots of the equation

$$X^2 - KX + 2b^{201} - a^{201} - c^{201} = 0, (K \in \mathbb{R}) \text{ has}$$

- (a) > 0
- (b) $= 0$
- (c) < 0
- (d) Underfined

Q4

The remainder obtained, when $1! + 2! + 3! + \dots + 100!$ is divisible by 15 is

- (a) 0
- (b) 3
- (c) 5
- (d) 7

Q5

If the coefficient of x^2 in the expansion of $(1 + ax)^5$, ($a > 0$) is 32, then a is equal to

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

Q6

Let $f(x) = \begin{vmatrix} \sin x & \cos x \\ \sin 2x & \cos 2x \end{vmatrix}$ then $f'(\frac{\pi}{4})$ is equal to

- (a) $\frac{1}{\sqrt{2}}$
- (b) 1
- (c) $-\frac{1}{\sqrt{2}}$
- (d) None of these

Q7

If $A^3 + 3A^2 + 5A - I = 0$, then A^{-1} is equal to

- (a) $A^2 + 3A + 5I$
- (b) $A^2 - 3A + I$
- (c) $A^2 + A + 5I$
- (d) None of these

Q8

If $a = \log_3 2$, $b = \log_5 3$, $c = \log_7 5$ then $\log_{210} 60$ is equal to

- (a) $\frac{ab+1}{abc+bc+1}$
- (b) $\frac{2ab+b+1}{abc+bc+c+1}$
- (c) $\frac{2ab+c}{abc+c}$
- (d) None of these

Q9

A dice is thrown $(2n + 1)$ times. The probability that faces with odd number appear odd number of times is

- (a) $\frac{1}{2}$
- (b) $\frac{2n+1}{2n+3}$
- (c) $\frac{2n-1}{2n+1}$
- (d) None of these

Q10

If the probability for A to fail in examination is 0.4 and that for B is 0.3, then the probability that at least one of them fails is

- (a) 0.5
- (b) 0.12
- (c) 0.64
- (d) 0.58

Q11

$\lim_{x \rightarrow 2} [x]$ is equal to

- (a) 0
- (b) 1
- (c) 2
- (d) Does not exist

Q12

$\lim_{n \rightarrow \infty} \frac{n^p \cos n!}{n+2}$, $0 < p < 1$ is equal to

- (a) 1
- (b) 0
- (c) ∞
- (d) None of these

Q13

Let f be a function satisfying $f(x+y) = f(x) + f(y)$ and $f(x) = x^3 g(x)$ for all x and y , where $g(x)$ is continuous function, then $f'(x)$ is equal to

- (a) 0
- (b) $2x$
- (c) $g'(x)$
- (d) None of these

Q14

If $x^y = y^x$ then $\frac{dy}{dx}$ at $(1, 2)$ is equal to

- (a) $\log 2 - 2$
- (b) $2(\log 2 - 2)$
- (c) $-2(\log 2 - 2)$
- (d) None of these

Q15

If $y = \sqrt{x + \sqrt{x + \sqrt{x + \dots \dots \dots \infty}}}$ then $\frac{dy}{dx}$ is equal to

- (a) $\frac{1}{2y-1}$
- (b) $\frac{1}{x-y}$
- (c) $\frac{1}{x^2+y^2}$
- (d) None of these

Q16

The function $f(x) = \sin\left(\frac{\pi}{x}\right)$ is increasing in the interval

- (a) $\left(\frac{1}{4n+1}, \frac{1}{4n-1}\right), n \in \mathbb{N}$
- (b) $\left(\frac{2}{4n+1}, \frac{2}{4n-1}\right), n \in \mathbb{N}$
- (c) $\left(\frac{1}{2n+1}, \frac{1}{2n-1}\right), n \in \mathbb{N}$
- (d) None of these

Q17

The points of extremum of the function

$$f(x) = \int_2^x e^{-t^2} (4 - t^2) dt \text{ are}$$

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

Q18

$\int \frac{5+4 \sin x}{(4+5 \sin x)^2} dx$ is equal to

- (a) $\frac{1}{4 \tan x + 5 \sec x} + c$
- (b) $-\frac{1}{4 \sec x + 5 \tan x} + c$
- (c) $\frac{1}{\sec^2 x} + c$
- (d) None of these

Q19

If $\int_0^\infty e^{x^2} dx = b$, then $\int_0^\infty e^{ax^2}$ is equal to

- (a) $\frac{b}{a}$
- (b) $\frac{\sqrt{b}}{a}$
- (c) $\frac{b}{\sqrt{a}}$
- (d) None of these

Q20

The area bounded by $y = \frac{\sin x}{x}$, x axis and ordinates $x = 0$, $x = \frac{\pi}{2}$ is

- (a) $= \frac{\pi}{4}$
- (b) $< \frac{\pi}{4}$
- (c) $< \frac{\pi}{2}$
- (d) $> \frac{\pi}{2}$

Q21

The solution of the differential equation

$x^3 y^3 dx = (y dx - x dy)$ is

- (a) $\frac{x^5}{5} - \frac{x^2}{2y^2} = c$
- (b) $x^5 - \frac{x^2}{y^2} = c$
- (c) $x^6 + \frac{y}{x^3} = c$
- (d) None of these

Q22

The image of (a, b) on $x = y$ line is B and the image of B on $x = -y$ line is C. The mid point of AC is

- (a) $\left(\frac{a+b}{2}, \frac{b+a}{2}\right)$
- (b) $\left(\frac{a-b}{2}, \frac{b-a}{2}\right)$
- (c) (0,0)
- (d) (a + b, b + a)

Q23

Which of the following pairs of lines intersect at right angle

- (a) $(x + y)^2 = x(y - 2x)$
- (b) $2y(x - y) = xy$
- (c) $y = \pm 4x$
- (d) $3x^2 = y(-x + 3y)$

Q24

The center of the circle $r^2 = 1 - 2r\cos\theta + 3r\sin\theta$ is

- (a) $(-1, \frac{3}{2})$
- (b) $(1, -\frac{3}{2})$
- (c) $(-1, \frac{1}{2})$
- (d) $(\frac{1}{2}, \frac{1}{3})$

Q25

If $4x^2 + xy - 5y^2 = 0$ is the equation of a pair of conjugate diameters of an ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, then its eccentricity is

- (a) $\frac{1}{\sqrt{4}}$
- (b) $\frac{1}{\sqrt{5}}$
- (c) 1
- (d) None of these

Q26

The coordinates of a point on the line $\frac{x-1}{3} = \frac{y-1}{4} = z$ at a distance $3\sqrt{26}$ from the point $(1, 1, 0)$ nearer to origin are

- (a) $(-8, -11, -3)$
- (b) $(2, 7, 9)$
- (c) $(8, 5, 12)$
- (d) $(-8, -7, -11)$

Q27

If $\sin \alpha = \cos \beta$ and $\cos \alpha = \sin \beta$, then

- (a) $\cos\left(\frac{2\alpha + 2\beta - \pi}{4}\right) = 0$
- (b) $\cos\left(\frac{\alpha + \beta - \pi}{2}\right) = 0$
- (c) $\sin\left(\frac{2\alpha + 2\beta - \pi}{2}\right) = 0$
- (d) $\sin\left(\frac{2\alpha + 2\beta - \pi}{4}\right) = 0$

Q28

The general solution of the equation $\sin x + \cos x = 1$ is given by

- (a) $x = n\pi + \frac{\pi}{2}, n \in \mathbb{N}$
- (b) $x = n\pi - \frac{\pi}{2}, n \in \mathbb{N}$
- (c) $x = n\pi + (-1)^n \frac{\pi}{4} - \frac{\pi}{4}, n \in \mathbb{N}$
- (d) $x = n\pi + (-1)^n \frac{\pi}{2}, n \in \mathbb{N}$

Q29

Let $\vec{a}, \vec{b}, \vec{c}$ be three vectors such that $5\vec{a} + 6\vec{b} + 7\vec{c} = 0$, then which of the following statements is true

- (a) $\vec{a}, \vec{b}, \vec{c}$ are mutually perpendicular
- (b) \vec{a} is perpendicular to \vec{b}
- (c) \vec{b} is perpendicular to \vec{c}
- (d) $\vec{a}, \vec{b}, \vec{c}$ are coplanar.

Q30

Let $\vec{a}, \vec{b}, \vec{c}$ be three coplanar vectors and \vec{r} be any vector in space such that $\vec{r} \cdot \vec{a} = 3, \vec{r} \cdot \vec{b} = 5$ and $\vec{r} \cdot \vec{c} = 7$. If $[\vec{a}, \vec{b}, \vec{c}] = 1$ then \vec{r} is equal to

- (a) $3\vec{a} + 5\vec{b} + 7\vec{c}$
- (b) $\vec{a} \cdot \vec{b} + \vec{b} \cdot \vec{c} + \vec{c} \cdot \vec{a}$
- (c) $3\vec{a} \times \vec{b} + 5\vec{c} + 7\vec{c} \times \vec{a}$
- (d) $3(\vec{b} \times \vec{c}) + 5(\vec{c} \times \vec{a}) + (\vec{a} \times \vec{b})$