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) HCI
(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) $AgNO_4$
(b) Ag_2O
(c) AgOH
(d) $[Ag(NH_3)_2]^+$

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 $Na_3[Co(NO_2)_6]$ is

(a) Sodium hexanitrito cabaltate (III)
(b) Sodium cobaltinitrite
(c) Sodium hexanitrocobaltate (III)
(d) Sodium cobalt haxanitrite

Q9

Ziegler Natta catalyst is an organometallic compound of

(a) Iron
(b) Zeroconium
(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) [Ar] $3d^{10}\ 4s^2\ 4p^3$
(b) [Ne] $3s^2\ 3p^3$
(c) [Ne] $3s^2\ 3p^2$
(d) [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) $S_2O_4^{2-}$
(b) $S_2\ O_5^{2-}$
(c) $S_2O_3^{2-}$
(d) $S_2\ O_7^{2-}$

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) $Au(NO_3)_3$

Q16

Which of the following salts is used in medicine 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

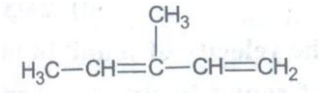
Q19

In the reaction, $C_6H_5CH_3 \xrightarrow{Oxidation} A \xrightarrow{Oxidation} A \xrightarrow{NaOH} B \xrightarrow{\text{sodaime}} C$, the product C is

(a) C_6H_5OH
(b) C_6H_6
(c) C_6H_5COONa
(d) C_6H_5ONa

Q20

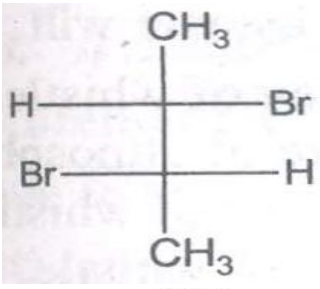
Which set of products is expected on reductive ozonolysis of the following diolefin?

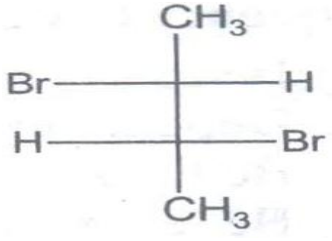


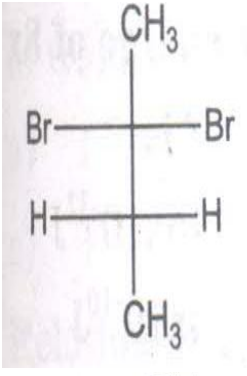
(a) (CH_3CHO, $CH_3CH_3COCH=CH_2$
(b) $CH_3CH=C(CH_3)CHO : CH_2O$
(c) $CH_3CHO ; CH_3COCHO : CH_2O$
(d) $CH_3CHO : CH_3COCH_3 : CH_2O$

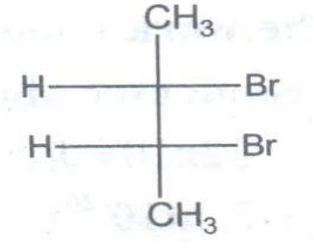
Q21

Trans-2-butene + Br_2 gives

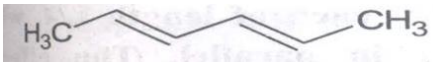
(a) 

(b) 

(c) 

(d) 

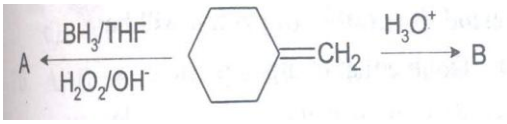
Q22

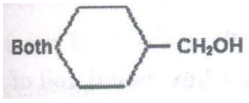
The name of the compound is : 

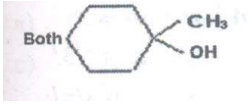
(a) (2Z, 4Z)-2, 4 – hexadience
(b) (2Z, 4E)-2, 4 – hexadience
(c) (2E, 4Z) -2, 4 – hexadience
(d) (2E, 4E)-2, 4 – hexadience

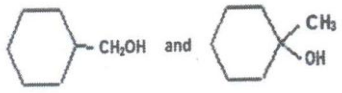
Q23

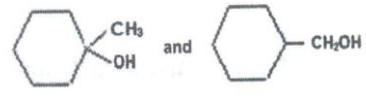
A and B in the following reactions are



(a) 

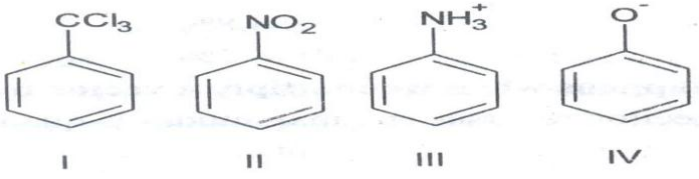
(b) 

(c) 

(d) 

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) Trimethylsteayl 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 in used in some fireworks. The green colored powder blown in the air is

(a) CrO_3
(b) Cr_2O_3
(c) Cr
(d) $Cr_2O_7^{2-}$

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 reveres 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 of 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 disk is spinning at a rate of 10 rad/s. A second disk of the same mass and shape, with no spin, is placed on top of the first disk. Friction acts between the two disks until both are eventually traveling at the same speed. What is the final angular velocity of the two disks?

(a) 8 rad/s
(b) 6 rad/s
(c) 4rad/s
(d) 5rad/s

Q6

Principle of superposition is valid for

(a) Gravitational force
(b) Nuclear force
(c) Both gravitational and nuclear forces
(d) Nuclear frorce 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 $1/8^{th}$ 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) $V_m > D_d$

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 μF 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 partile
(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. circult, V and I are given by

V = 100 sin (100t) Volt and

I = 100 sin (100t + $\pi/3$) 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 anges, 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 A°
(b) 10^{-10} cm
(c) 10^{-12} cm
(d) 10^{-15}cm

MATHEMATICS

Q1

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

(a) Re (z) = 2Im (z)
(b) Re (z) = 0
(c) Im (z) = 0
(d) Re (z) + 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

$x^2 - Kx + 2b^{201} - a^{201} - c^{201} = 0$, $(K \in R)$ has

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

Q4

The remainder obtained, when 1! + 2! + 3! + ... 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) = $\begin{vmatrix} sinx & cosx \\ sin2x & cos2x \end{vmatrix}$ then $f'\left(\frac{\pi}{4}\right)$ 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 $a = \log_3 2$, $b = \log_s$, $c = \log_7 5$ 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 tese

Q9

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

$\text{Lt}_{x \to 2}$ [x] is equal to

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

Q12

$\text{Lt}_{n \to \infty} \frac{n^p \cos n!}{n+2}$, $0 < p < 1$ 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 $y = \sqrt{x + \sqrt{x + \sqrt{x + \ldots\ldots\infty}}}$ 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) $\left(\frac{1}{4\,n+1}, \frac{1}{4n-1}\right)$, n ∈ N
(b) $\left(\frac{2}{4n+1}, \frac{2}{4n\,-\,1}\right)$, n ∈ N
(c) $\left(\frac{1}{2n+1}, \frac{1}{2n-1}\right)$, n ∈ N
(d) None of these

Q17

The points of extremum of the function

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

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

Q18

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

(a) $\frac{1}{4tanx\ +5\ secx} + c$
(b) $-\frac{1}{4secx\ +5\ tanx} + c$
(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 $y = \frac{sinx}{x}$, 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

$x^3y^3dx = (ydx - xdy)$ 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) $\left(-1, \frac{3}{2}\right)$
(b) $\left(1, -\frac{3}{2}\right)$
(c) $\left(-1, \frac{1}{2}\right)$
(d) $\left(\frac{1}{2}, \frac{1}{3}\right)$

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 $\sin\alpha = \cos ß$ and $\cos\alpha = \sin ß$, then

(a) $\cos\left(\frac{2\alpha+2ß-\pi}{4}\right) = 0$
(b) $\cos\left(\frac{\alpha + ß - \pi}{2}\right) = 0$
(c) $\sin\left(\frac{2\alpha + 2ß - \pi}{2}\right) = 0$
(d) $\sin\left(\frac{2\alpha + 2ß - \pi}{8}\right) = 0$

Q28

The general solution of the equation sinx + cosx = 1 is given by

(a) $x = n\pi + \frac{\pi}{2}$, $n \in N$

(b) $x = n\pi - \frac{\pi}{2}$, $n \in N$

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

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

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 $\vec{r}.\ \vec{a} = 3$, $\vec{r}.\ \vec{b} = 5$ and $\vec{r}.\ \vec{c} = 7$. 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) $\vec{a}.\vec{b} + \vec{b}.\vec{c} + \vec{c}\ .\ \vec{a}$

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

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