

Mathematics:

Q1. If $1, \omega, \omega^2$ are cube roots of unity, then the value of $(1 + \omega^2 - \omega)(1 - \omega^2 + \omega)$ is

- a) 4 b) ω c) 2 d) zero.

Q2. The value of $\sin(\cot^{-1} x)$ is

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

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

c) $\frac{\sqrt{1+x^2}}{x}$

d) $\sqrt{1+x^2}$

Q3. Two circles $x^2 + y^2 - 6x + 8 = 0$ and $x^2 + y^2 - 6y = 0$ are given. The equation of the circle through their point of intersection and the point (1,1) is

- a) $x^2 + y^2 - 3x + 1 = 0$ b) $x^2 + y^2 - 5 = 0$
c) $x^2 + y^2 - 8x + 6y = 8$ d) $x^2 + y^2 - 4x + 8y = 7$

Q4. The value of $\int_0^{\pi/2} \frac{1}{1 + \sqrt{\tan x}} dx$ is

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

Q5. The volume of the parallelepiped whose edges are represented by $-12\mathbf{i} + \lambda\mathbf{k}$, $3\mathbf{j} - \mathbf{k}$, $2\mathbf{i} + \mathbf{j} - 15\mathbf{k}$ is 546. Then the value of λ is

- a) -5 b) 6 c) 1 d) -3

Physics

Q1. A boat takes time t to go downstream from point A to point B and time $2t$ to go upstream from point B to point A . If the speed of the stream is v and the speed of the boat with respect to the stream is u , then which of the following gives the correct relationship between u & v ?

- a) $u = v$
- b) $u = 3v$
- c) $v = 2u$
- d) $v = 3u$

Q2. Which of the following is correct about the acceleration of a particle describing a uniform circular motion ?

- a) The acceleration is constant both in magnitude and direction
- b) The acceleration is constant in direction but not in magnitude
- c) The acceleration is constant in magnitude but not in direction
- d) The acceleration is neither constant in magnitude nor in direction

Q3. Five identical resistors of resistance 1Ω each, are connected along the four edges and one of the diagonals of a square. A potential difference of 1 V is applied across the other diagonal. What will be the current in the resistor along the diagonal ?

- a) 0.5 A
- b) 1 A
- c) 5 A
- d) zero

Q4. A beam of completely unpolarized light of intensity I_0 is made to pass through a polarizer followed by an analyzer. What should be the angle between the axes of the polarizer and the analyzer, so that the intensity of the beam coming out of the analyzer is $\frac{3}{8}I_0$?

- a) 45°
- b) 30°
- c) 60°
- d) $\cos^{-1}(\sqrt{3/8})$ rad

Q5. The half-life of a certain radioactive element is T_0 . How long will it take for 75% of a sample of the element to decay ?

- a) $2T_0$
- b) T_0
- c) $\frac{3}{2}T_0$
- d) $3T_0$

Chemistry

1. In a sample of the non-stoichiometric crystal $Fe_{0.96}O$, the percentage of cationic sites occupied by Fe^{3+} ions is
(A) 8.0 (B) 6.0 (C) 4.0 (D) 2.0
2. Which of the elements Na, Mg, Al, and K has the highest second ionization energy?
(A) Na (B) Mg (C) Al (D) K
3. Diborane structure involves
(A) Two 2-centre 3-electron bonds and four 3-centre 2-electron bonds
(B) Four 2-centre 3-electron bonds and two 3-centre 2-electron bonds
(C) Four 2-centre 2-electron bonds and two 3-centre 2-electron bonds
(D) Two 2-centre 2-electron bonds and four 3-centre 2-electron bonds
4. Hoffmann rearrangement of a primary amide results in the formation of
(A) 1° amine with same number of carbons
(B) 1° amine with one carbon less
(C) 2° amine with one carbon less
(D) 1° amine with one carbon more
5. A haloalkane on treatment with NaOR forms:
(A) A thioether
(B) A secondary alcohol
(C) A primary alcohol
(D) An ether

English Proficiency

Q1. Select the most suitable verb form which can be used in the passive form of the following sentence.

He is teaching English.

(a) has been taught (b) is taught (c) is being taught (d) has been teaching.

Q2. Rearrange the jumbled letters to form a meaningful word: **aertun**

(a) nurture (b) nature (c) return (d) renter

Q3. Seventeenth-century attempts to preserve anatomical specimens brought about modern embalming, the preservation of the body after death by artificial chemical means. The most common agent used today is formaldehyde, which is infused to replace body fluids.

The second sentence can best be replaced by

- (a) Body fluids are replaced by formaldehyde, the most widely used agent today.
- (b) The most common agent “body fluids” are used to replace formaldehyde
- (c) Formaldehyde is most widely used today along with the body fluids
- (d) To replace body fluids the most common agent is to be used.

Q4. Which idea does not support the topic

Reasons for car accidents

- (a) fast driving
- (b) drinking and driving
- (c) not following traffic regulations
- (d) giving signals

Q5. Rearrange the sentences labeled A to E to form a coherent paragraph.

- A. The reasons why piracy flourishes are two.
- B. The problem is not with the laws but with enforcement.
- C. Somehow they still do not realize the seriousness of the crime or its economic ramifications.
- D. I have been a part of a drive against copyright theft for over two decades now.
- E. The first is the lack of awareness amongst the enforcement agencies.

(a) ADBCE (b) AECBD (c) DBAEC (d) ABDEC

Logic Reasoning:

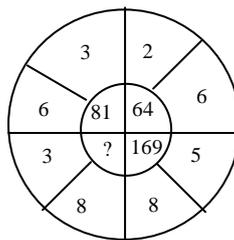
1. In the question given below choose the word, which is least like the other words in the group.

(a) Sri Lanka (b) Bangladesh (c) Pakistan (d) Singapore

2. BANK: MONEY :: TRANSPORT : ?

(a) Goods (b) School (c) Bus (d) Traffic

3. Find the missing number in the following question from the given alternatives.



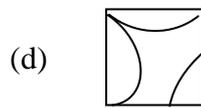
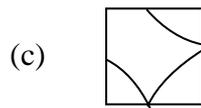
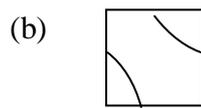
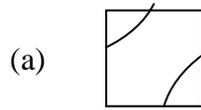
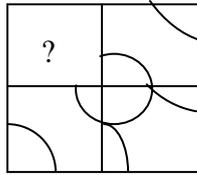
(a) 121

(b) 61

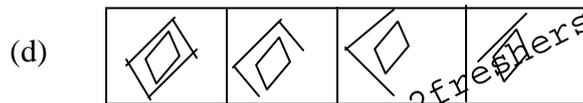
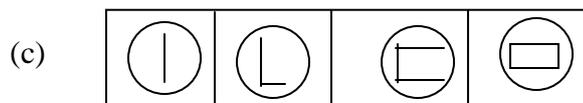
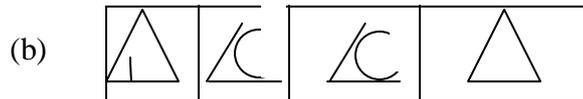
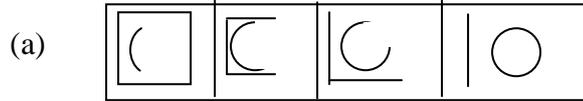
(c) 74

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4. In the following question complete the missing portion of the given pattern by selecting from the alternatives.



5. In the following question the rule is that “closed figures become more and more open and open figures become more and more closed.” Identify which set of figures follows the rule?



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Correct answers:

	Q1	Q2	Q3	Q4	Q5
Mathematics	a	b	a	c	d
Physics	b	c	d	b	a
Chemistry	a	a	c	b	d
English Proficiency	c	b	a	d	c
Logical Reasoning	d	a	a	c	a