

# National Testing Agency

**Question Paper Name :** PGQP28 15th Sep 2021 Shift 1  
**Subject Name :** PGQP28  
**Creation Date :** 2021-09-15 17:32:43  
**Duration :** 120  
**Total Marks :** 400  
**Display Marks:** Yes

## PGQP28

**Group Number :** 1  
**Group Id :** 19088917  
**Group Maximum Duration :** 0  
**Group Minimum Duration :** 120  
**Show Attended Group? :** No  
**Edit Attended Group? :** No  
**Break time :** 0  
**Group Marks :** 400  
**Is this Group for Examiner? :** No

## PART A - General

**Section Id :** 19088954  
**Section Number :** 1  
**Section type :** Online  
**Mandatory or Optional :** Mandatory

<b>Number of Questions :</b>	25
<b>Number of Questions to be attempted :</b>	25
<b>Section Marks :</b>	100
<b>Enable Mark as Answered Mark for Review and Clear Response :</b>	Yes
<b>Sub-Section Number :</b>	1
<b>Sub-Section Id :</b>	19088980
<b>Question Shuffling Allowed :</b>	Yes

**Question Number : 1 Question Id : 1908892092 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

Select the correct word that can best complete the given sentence:

A well-balanced diet can be a/an \_\_\_\_\_ for stress.

- |              |              |
|--------------|--------------|
| (1) spirit   | (2) buffer   |
| (3) antidote | (4) medicine |

**Options :**

1908898301. 1

1908898302. 2

1908898303. 3

1908898304. 4

**Question Number : 2 Question Id : 1908892093 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

From the choices given below, select the pair which exhibits the same relationship as the one in capitalized pair of words:

HERBS : MEDICINE

- |                       |                    |
|-----------------------|--------------------|
| (1) books : knowledge | (2) sound : radio  |
| (3) time : watch      | (4) juice : orange |

**Options :**

1908898305. 1

1908898306. 2

1908898307. 3

1908898308. 4

**Question Number : 3 Question Id : 1908892094 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Select the most suitable synonym:

ADEPT

(1) devious

(2) wily

(3) clumsy

(4) dexterous

**Options :**

1908898309. 1

1908898310. 2

1908898311. 3

1908898312. 4

**Question Number : 4 Question Id : 1908892095 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Identify the part of the body with which the disease is associated:

Hepatitis

(1) gall bladder

(2) diaphragm

(3) stomach

(4) liver

**Options :**

1908898313. 1

1908898314. 2

1908898315. 3

1908898316. 4

**Question Number : 5 Question Id : 1908892096 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Identify the meaning of the expression below from the options given:

ex officio

- |                        |                                 |
|------------------------|---------------------------------|
| (1) unofficial         | (2) as a result of one's status |
| (3) a retired official | (4) make public                 |

**Options :**

1908898317. 1

1908898318. 2

1908898319. 3

1908898320. 4

**Question Number : 6 Question Id : 1908892097 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Identify the meaning of the underlined word:

Confidence in government hospitals has eroded considerably in the past decade.

- |                         |                    |
|-------------------------|--------------------|
| (1) gradually destroyed | (2) been reimposed |
| (3) corroded            | (4) withered       |

**Options :**

1908898321. 1

1908898322. 2

1908898323. 3

1908898324. 4

**Question Number : 7 Question Id : 1908892098 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Identify the meaning of the phrase below from the options given:

A person who helps others specially those who are poor or in trouble

- |                 |                    |
|-----------------|--------------------|
| (1) philhellene | (2) philadelphus   |
| (3) philanderer | (4) philanthropist |

**Options :**

1908898325. 1

1908898326. 2

1908898327. 3

1908898328. 4

**Question Number : 8 Question Id : 1908892099 Question Type : MCQ Option Shuffling : No Is**

**Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Select the most suitable antonym:

ERRATIC

- |             |            |
|-------------|------------|
| (1) loose   | (2) faulty |
| (3) regular | (4) brave  |

**Options :**

1908898329. 1

1908898330. 2

1908898331. 3

1908898332. 4

**Question Number : 9 Question Id : 1908892100 Question Type : MCQ Option Shuffling : No Is**

**Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Identify the meaning of the idiom from the options given:

A bird's-eye view

- |                     |                      |
|---------------------|----------------------|
| (1) without care    | (2) within the walls |
| (3) an overall view | (4) out of place     |

**Options :**

1908898333. 1

1908898334. 2

1908898335. 3

1908898336. 4

**Question Number : 10 Question Id : 1908892101 Question Type : MCQ Option Shuffling : No Is**

**Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Select the correct word from the answer:

Farmers know that changing winds \_\_\_\_\_ rain or drought.

- |           |             |
|-----------|-------------|
| (1) bring | (2) create  |
| (3) form  | (4) present |

**Options :**

1908898337. 1

1908898338. 2

1908898339. 3

1908898340. 4

**Question Number : 11 Question Id : 1908892102 Question Type : MCQ Option Shuffling : No Is**

**Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

The H.C.F. (Highest Common Factor) of 3556 and 3444 is :

- |        |        |
|--------|--------|
| (1) 23 | (2) 25 |
| (3) 26 | (4) 28 |

**Options :**

1908898341. 1

1908898342. 2

1908898343. 3

1908898344. 4

**Question Number : 12 Question Id : 1908892103 Question Type : MCQ Option Shuffling : No Is**

**Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

If  $a + b = 5$  and  $3a + 2b = 20$ , then  $(3a + b)$  will be :

- |        |        |
|--------|--------|
| (1) 10 | (2) 15 |
| (3) 20 | (4) 25 |

**Options :**

1908898345. 1

1908898346. 2

1908898347. 3

1908898348. 4

**Question Number : 13 Question Id : 1908892104 Question Type : MCQ Option Shuffling : No Is**

**Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

If the sum of a number and its square is 182, what is the number?

- |        |                   |
|--------|-------------------|
| (1) 15 | (2) 26            |
| (3) 28 | (4) None of these |

**Options :**

1908898349. 1

1908898350. 2

1908898351. 3

1908898352. 4

**Question Number : 14 Question Id : 1908892105 Question Type : MCQ Option Shuffling : No Is**

**Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

$$88\% \text{ of } 370 + 24\% \text{ of } 210 - ? = 118$$

(1) 256

(2) 258

(3) 268

(4) 358

**Options :**

1908898353. 1

1908898354. 2

1908898355. 3

1908898356. 4

**Question Number : 15 Question Id : 1908892106 Question Type : MCQ Option Shuffling : No Is**

**Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

**Choose the correct alternative based on relationship:**

Tractor : Trailer :: Horse : ?

(1) Stable

(2) Cart

(3) Saddle

(4) Engine

**Options :**

1908898357. 1

1908898358. 2

1908898359. 3

1908898360. 4



**Question Number : 16 Question Id : 1908892107 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Choose the word which is least like the other words in the group:

- |                  |                 |
|------------------|-----------------|
| (1) Geometry     | (2) Algebra     |
| (3) Trigonometry | (4) Mathematics |

**Options :**

1908898361. 1

1908898362. 2

1908898363. 3

1908898364. 4

**Question Number : 17 Question Id : 1908892108 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Choose the number which is different from others in the group.

- |          |          |
|----------|----------|
| (1) 8314 | (2) 2709 |
| (3) 1315 | (4) 2518 |

**Options :**

1908898365. 1

1908898366. 2

1908898367. 3

1908898368. 4

**Question Number : 18 Question Id : 1908892109 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

If PALE is coded as 2134, EARTH is coded as 41590, how is PEARL coded in that code?

- (1) 29530 (2) 24153  
(3) 25413 (4) 25430

**Options :**

1908898369. 1

1908898370. 2

1908898371. 3

1908898372. 4

**Question Number : 19 Question Id : 1908892110 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Rahul told Anand, 'Yesterday I defeated the only brother of the daughter of my grandmother.' Whom did Rahul defeat?

- (1) Son (2) Father  
(3) Brother (4) Father-in-law

**Options :**

1908898373. 1

1908898374. 2

1908898375. 3

1908898376. 4

**Question Number : 20 Question Id : 1908892111 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Arrange the given words in alphabetical order and choose the one that comes first.

- (1) Science (2) Scrutiny  
(3) Scripture (4) Scramble

**Options :**

1908898377. 1

1908898378. 2

1908898379. 3

1908898380. 4

**Question Number : 21 Question Id : 1908892112 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

If Atul finds that he is twelfth from the right in a line of boys and fourth from the left, how many boys should be added to the line such that there are 28 boys in the line?

(1) 12

(2) 13

(3) 14

(4) 20

**Options :**

1908898381. 1

1908898382. 2

1908898383. 3

1908898384. 4

**Question Number : 22 Question Id : 1908892113 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

The India Energy Outlook 2021 is a new special report from the

(1) NITI Aayog

(2) Ministry of Power

(3) International Energy Agency

(4) Ministry of New and Renewable Energy

**Options :**

1908898385. 1

1908898386. 2

1908898387. 3

1908898388. 4

**Question Number : 23 Question Id : 1908892114 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Who among the following wrote the famous book titled 'We the people'?

- |                         |                     |
|-------------------------|---------------------|
| (1) T. N. Seshan        | (2) KiranBedi       |
| (3) Nanabhoy Palkhivala | (4) Khushwant Singh |

**Options :**

1908898389. 1

1908898390. 2

1908898391. 3

1908898392. 4

**Question Number : 24 Question Id : 1908892115 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Which of following committees is related to 'Personal Data Protection'?

- |                                |                             |
|--------------------------------|-----------------------------|
| (1) B. N. Srikrishna Committee | (2) C. Rangarajan Committee |
| (3) Bimal Jalan Committee      | (4) Bhurelal Committee      |

**Options :**

1908898393. 1

1908898394. 2

1908898395. 3

1908898396. 4

**Question Number : 25 Question Id : 1908892116 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Galathea National Park is located in

(1) Andaman and Nicobar

(2) Lakshadweep

(3) Coromandel Coast

(4) Konkan Coast

**Options :**

1908898397. 1

1908898398. 2

1908898399. 3

1908898400. 4

## **PART B - PHYSICS**

<b>Section Id :</b>	19088955
<b>Section Number :</b>	2
<b>Section type :</b>	Online
<b>Mandatory or Optional :</b>	Mandatory
<b>Number of Questions :</b>	75
<b>Number of Questions to be attempted :</b>	75
<b>Section Marks :</b>	300
<b>Enable Mark as Answered Mark for Review and Clear Response :</b>	Yes
<b>Sub-Section Number :</b>	1
<b>Sub-Section Id :</b>	19088981
<b>Question Shuffling Allowed :</b>	Yes

**Question Number : 26 Question Id : 1908892117 Question Type : MCQ Option Shuffling : No Is**

**Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**





The relaxation time of a damped harmonic oscillator is 50 seconds. The time in which the energy of the oscillator falls to  $1/e$  times its initial value will be

- |                |                   |
|----------------|-------------------|
| (1) 50 seconds | (2) 100 seconds   |
| (3) Infinite   | (4) 0.001 seconds |

**Options :**

1908898417. 1

1908898418. 2

1908898419. 3

1908898420. 4

**Question Number : 31 Question Id : 1908892122 Question Type : MCQ Option Shuffling : No Is**

**Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

When two mutually perpendicular simple harmonic motions of same frequency, amplitude and phase are superimposed:

- (1) The resulting motion is uniform circular motion
- (2) The resulting motion is a linear SHM along a straight line inclined equally to the straight lines of the motion of the components ones
- (3) Resulting motion is an elliptical motion, symmetrical about the lines of motion of the components
- (4) The two SHMs will cancel each other

**Options :**

1908898421. 1

1908898422. 2

1908898423. 3

1908898424. 4

**Question Number : 32 Question Id : 1908892123 Question Type : MCQ Option Shuffling : No Is**

**Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**







**Options :**

1908898441. 1

1908898442. 2

1908898443. 3

1908898444. 4

**Question Number : 37 Question Id : 1908892128 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

In Newton's rings arrangement, bright and dark rings are obtained using sodium yellow light. What happens if the top surface of the glass plate on which the lens is kept is highly silvered:

- |                            |                                   |
|----------------------------|-----------------------------------|
| (1) Fringes disappear      | (2) Fringe width remain unchanged |
| (3) Fringe width decreases | (4) Fringe width increases        |

**Options :**

1908898445. 1

1908898446. 2

1908898447. 3

1908898448. 4

**Question Number : 38 Question Id : 1908892129 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

A single slit is illuminated by a light composed of two wavelengths,  $\lambda_1$  and  $\lambda_2$ . Due to Fraunhofer diffraction, one observes that the first minimum obtained for  $\lambda_1$  coincides with the second minimum of  $\lambda_2$ . The relationship between  $\lambda_1$  and  $\lambda_2$  is

- |                              |                              |
|------------------------------|------------------------------|
| (1) $\lambda_1 = \lambda_2$  | (2) $\lambda_1 = 2\lambda_2$ |
| (3) $2\lambda_1 = \lambda_2$ | (4) $\lambda_1 = 3\lambda_2$ |

**Options :**

1908898449. 1

1908898450. 2

1908898451. 3

1908898452. 4

**Question Number : 39 Question Id : 1908892130 Question Type : MCQ Option Shuffling : No Is**

**Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

The orders observed by a grating having 4000 lines per cm when illuminated normally by visible light of wavelength range 400 nm to 700 nm:

- |            |            |
|------------|------------|
| (1) 2 to 4 | (2) 1 to 2 |
| (3) 1 to 3 | (4) 3 to 6 |

**Options :**

1908898453. 1

1908898454. 2

1908898455. 3

1908898456. 4

**Question Number : 40 Question Id : 1908892131 Question Type : MCQ Option Shuffling : No Is**

**Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Significant diffraction of X-rays can be obtained

- |                          |                                |
|--------------------------|--------------------------------|
| (1) by a single slit     | (2) by a double slit           |
| (3) by an atomic crystal | (4) plane transmission grating |

**Options :**

1908898457. 1

1908898458. 2

1908898459. 3

1908898460. 4

**Question Number : 41 Question Id : 1908892132 Question Type : MCQ Option Shuffling : No Is**

**Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

A ray of light is incident on a glass plate of refractive index 1.732 at polarizing angle. The angle of refraction will be:

- |                |                |
|----------------|----------------|
| (1) $60^\circ$ | (2) $30^\circ$ |
| (3) $90^\circ$ | (4) $0^\circ$  |

**Options :**

1908898461. 1

1908898462. 2

1908898463. 3

1908898464. 4

**Question Number : 42 Question Id : 1908892133 Question Type : MCQ Option Shuffling : No Is**

**Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Quartz has refractive indices 1.553 and 1.544. The thickness of the quarter wave plate for sodium light of wavelength 589 nm will be

- |                    |                   |
|--------------------|-------------------|
| (1) $0.163 \mu m$  | (2) $0.326 \mu m$ |
| (3) $0.0815 \mu m$ | (4) $0.652 \mu m$ |

**Options :**

1908898465. 1

1908898466. 2

1908898467. 3

1908898468. 4

**Question Number : 43 Question Id : 1908892134 Question Type : MCQ Option Shuffling : No Is**

**Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**



1908898477. 1

1908898478. 2

1908898479. 3

1908898480. 4

**Question Number : 46 Question Id : 1908892137 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

The function

$$f(x) = \begin{cases} -\pi & \text{for } -\pi < x \leq 0 \\ \pi & \text{for } 0 < x \leq \pi \end{cases}$$

Be a periodic function of period  $2\pi$ . The coefficient of  $\sin 5x$  in the Fourier series expansion of  $f(x)$  in the interval  $[-\pi, \pi]$  is

(1)  $4/5$

(2)  $5/4$

(3)  $4/3$

(4)  $3/4$

**Options :**

1908898481. 1

1908898482. 2

1908898483. 3

1908898484. 4

**Question Number : 47 Question Id : 1908892138 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

The Fourier series of an odd periodic function will consist of

(1) Sine terms only

(2) Cosine terms only

(3) Constant terms only

(4) All the three terms

**Options :**

1908898485. 1

1908898486. 2

1908898487. 3

1908898488. 4

**Question Number : 48 Question Id : 1908892139 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Let  $\vec{a}$  and  $\vec{b}$  be two distinct three dimensional vectors. The component of  $\vec{b}$  that is perpendicular to  $\vec{a}$  is given by

(1)  $\frac{\vec{a} \times (\vec{b} \times \vec{a})}{a^2}$

(2)  $\frac{\vec{b} \times (\vec{a} \times \vec{b})}{b^2}$

(3)  $\frac{\vec{a}(\vec{b} \cdot \vec{a})}{a^2}$

(4)  $\frac{\vec{b}(\vec{b} \cdot \vec{a})}{b^2}$

**Options :**

1908898489. 1

1908898490. 2

1908898491. 3

1908898492. 4

**Question Number : 49 Question Id : 1908892140 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Which one the following is Dirichlet condition

- (1) Function must have a finite number of maxima and minima in expansion interval
- (2) Function can have an infinite number of finite discontinuities in expansion interval
- (3)  $(f(t))^2$  must be absolutely summable
- (4)  $\int_{t_1}^{\infty} f(t) dt < \infty$

**Options :**

1908898493. 1

1908898494. 2



1908898495. 3

1908898496. 4

**Question Number : 50 Question Id : 1908892141 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Which of the following functions can be used as an integrating factor to turn the following non-exact equation into an exact equation?

$$(3y \cos x - xy \sin x) + 2x \cos x \frac{dy}{dx} = 0?$$

(1)  $x^2$

(2)  $x^2y$

(3)  $y^2$

(4)  $xy^2$

**Options :**

1908898497. 1

1908898498. 2

1908898499. 3

1908898500. 4

**Question Number : 51 Question Id : 1908892142 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

The value of integral  $\int_0^{\infty} \frac{x^{a-1}}{1+x} dx$ , where  $0 < a < 1$ ; will be

(1)  $\frac{\pi}{\sin \pi a}$

(2)  $\frac{2\pi}{\sin \pi a}$

(3)  $\frac{\pi}{\sin 2\pi a}$

(4)  $\frac{\pi}{2 \sin \pi a}$

**Options :**

1908898501. 1

1908898502. 2

1908898503.3

1908898504.4

**Question Number : 52 Question Id : 1908892143 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

The value of  $m$ , so that  $2x - x^2 + my^2$  may be harmonic is:

- (1) 0 (2) 2  
(3) 3 (4) 1

**Options :**

1908898505.1

1908898506.2

1908898507.3

1908898508.4

**Question Number : 53 Question Id : 1908892144 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

The solution of  $\frac{\partial u}{\partial t} = 4 \frac{\partial u}{\partial x}$  is

- (1)  $Ae^{kx+t}$  (2)  $Ae^{k(x+t)}$   
(3)  $Ae^{x+t}$  (4)  $Ae^{k\left(\frac{x}{4}+t\right)}$

**Options :**

1908898509.1

1908898510.2

1908898511.3

1908898512.4

Question Number : 54 Question Id : 1908892145 Question Type : MCQ Option Shuffling : No Is

Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Which of the following matrices is skew Hermitian:

(1)  $\begin{bmatrix} 0 & i \\ i & 0 \end{bmatrix}$

(2)  $\begin{bmatrix} 0 & i \\ -i & 0 \end{bmatrix}$

(3)  $\begin{bmatrix} i & 0 \\ 0 & i \end{bmatrix}$

(4)  $\begin{bmatrix} i & 0 \\ 0 & -i \end{bmatrix}$

Options :

1908898513. 1

1908898514. 2

1908898515. 3

1908898516. 4

Question Number : 55 Question Id : 1908892146 Question Type : MCQ Option Shuffling : No Is

Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The solution of differential equation

$x \log x \frac{dy}{dx} + y = 2 \log x$  is:

(1)  $y \log x = (\log x)^2 + C$

(2)  $y = (\log x)^2 + C$

(3)  $y = 2 \log x + C$

(4)  $y = x (\log x)^2 + C$

Options :

1908898517. 1

1908898518. 2

1908898519. 3

1908898520. 4

Question Number : 56 Question Id : 1908892147 Question Type : MCQ Option Shuffling : No Is

**Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

A charge  $q$  is placed at a distance  $3R$  from the center of a grounded conducting sphere of radius  $R$ . The image charge and its distance are respectively:

(1)  $-\frac{q}{3}$  and  $\frac{R}{3}$

(2)  $-\frac{q}{3}$  and  $\frac{R}{6}$

(3)  $-q$  and  $\frac{R}{3}$

(4)  $\frac{q}{3}$  and  $\frac{R}{3}$

**Options :**

1908898521. 1

1908898522. 2

1908898523. 3

1908898524. 4

**Question Number : 57 Question Id : 1908892148 Question Type : MCQ Option Shuffling : No Is**

**Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

The Laplace's equation in CGS Gaussian system is:

(1)  $\nabla^2 V = -\frac{\rho_0}{\epsilon_0}$

(2)  $\nabla^2 V = -4\pi\rho$

(3)  $\nabla^2 V = -4\pi\sigma$

(4)  $\nabla^2 V = 0$

**Options :**

1908898525. 1

1908898526. 2

1908898527. 3

1908898528. 4

**Question Number : 58 Question Id : 1908892149 Question Type : MCQ Option Shuffling : No Is**

**Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

The ratio of the intensity of magnetic field at the center of a very long solenoid to that at the extreme ends is:

- (1) 2 (2) 1/2  
(3) 4 (4) 1/4

**Options :**

1908898529. 1  
1908898530. 2  
1908898531. 3  
1908898532. 4

**Question Number : 59 Question Id : 1908892150 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

The electric field associated with an electromagnetic wave propagating in free space is given as:

$$\vec{E} = E_0 \cos(kz - \omega t) \hat{i} + E_0 \cos(kz + \omega t) \hat{i}$$

The average energy carried by the wave is

- (1) 0 (2)  $\frac{E_0 B_0}{\mu_0}$   
(3)  $\frac{2E_0 B_0}{\mu_0}$  (4)  $\frac{E_0 B_0}{2\mu_0}$

**Options :**

1908898533. 1  
1908898534. 2  
1908898535. 3  
1908898536. 4

**Question Number : 60 Question Id : 1908892151 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

In an electromagnetic wave, the electric field of amplitude 6.2 V/m oscillates with a frequency of  $2.4 \times 10^{10}$  Hz. The Energy density of the wave is:

- (1)  $1.4 \times 10^{-10} \text{J/m}^3$                       (2)  $2.4 \times 10^{-10} \text{J/m}^3$   
(3)  $3.4 \times 10^{-10} \text{J/m}^3$                       (4)  $4.4 \times 10^{-10} \text{J/m}^3$

**Options :**

1908898537. 1

1908898538. 2

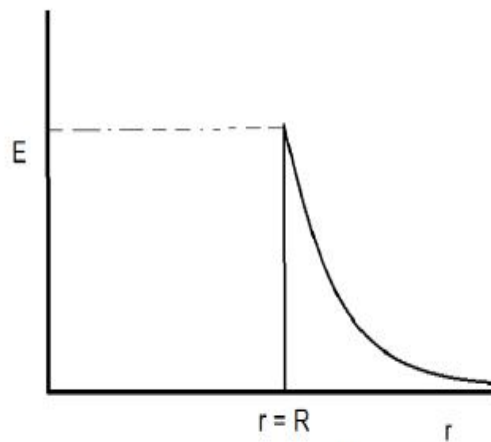
1908898539. 3

1908898540. 4

**Question Number : 61 Question Id : 1908892152 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

This variation of electric field with distance is observed in which of the following objects:



- (1) Line of charge                      (2) Sheet of charge  
(3) Solid Sphere                      (4) Spherical Shell

**Options :**

1908898541. 1

1908898542. 2

1908898543. 3

1908898544. 4

**Question Number : 62 Question Id : 1908892153 Question Type : MCQ Option Shuffling : No Is**

**Question Mandatory : No****Correct Marks : 4 Wrong Marks : 1**

The plane electromagnetic wave has the magnetic field

$$\vec{B}(x, y, z) = B_0 \sin \left[ (x + y) \frac{k}{\sqrt{2}} + \omega t \right] \hat{k};$$

where,  $k$  is wave number and  $\hat{i}, \hat{j}$  and  $\hat{k}$  are the unit

vectors along  $x, y$  and  $z$  directions respectively. The average pointing vector is:

- |   |  |
|---|--|
| (1) $-\frac{B_0^2 C^2 k}{2\mu_0 \omega} \left( \frac{\hat{i} + \hat{j}}{2} \right)$ units | (2) $\frac{B_0^2 C^2 k}{2\mu_0 \omega} \left( \frac{\hat{i} + \hat{j}}{2} \right)$ units |
| (3) $-\frac{B_0^2 C^2 k}{2\mu_0 \omega} \left( \frac{\hat{i} + \hat{k}}{2} \right)$ units | (4) $\frac{B_0^2 C^2 k}{2\mu_0 \omega} \left( \frac{\hat{i} + \hat{k}}{2} \right)$ units |

**Options :**

1908898545. 1

1908898546. 2

1908898547. 3

1908898548. 4

**Question Number : 63 Question Id : 1908892154 Question Type : MCQ Option Shuffling : No Is****Question Mandatory : No****Correct Marks : 4 Wrong Marks : 1**

The state of polarization of the electromagnetic wave with field components

$$E_x = E_0 \sin \left( kz - \omega t + \frac{\pi}{4} + 90^\circ \right)$$

$$E_y = \frac{1}{\sqrt{2}} E_0 \sin(kz - \omega t)$$

is

- |                               |                                 |
|-------------------------------|---------------------------------|
| (1) Linearly polarized        | (2) Right circularly polarized  |
| (3) Left circularly polarized | (4) Left elliptically polarized |

**Options :**

1908898549. 1

1908898550. 2

1908898551. 3





**Question Number : 66 Question Id : 1908892157 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

All natural processes are irreversible. This is a direct consequence of

- |                                 |                                  |
|---------------------------------|----------------------------------|
| (1) First law of thermodynamics | (2) Second law of thermodynamics |
| (3) Third law of thermodynamics | (4) Gibb's paradox               |

**Options :**

1908898561. 1

1908898562. 2

1908898563. 3

1908898564. 4

**Question Number : 67 Question Id : 1908892158 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

In a cyclic process

- (1) Work done is zero
- (2) Work done by the system is equal to the quantity of heat given to the system
- (3) Work done does not depend on the quantity of heat given to the system
- (4) The internal energy of the system increases

**Options :**

1908898565. 1

1908898566. 2

1908898567. 3

1908898568. 4

**Question Number : 68 Question Id : 1908892159 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

A Carnot engine operating between  $27^{\circ}\text{C}$  and  $127^{\circ}\text{C}$  has efficiency equal to

- (1) 21% (2) 22%  
(3) 24% (4) 25%

**Options :**

1908898569. 1

1908898570. 2

1908898571. 3

1908898572. 4

**Question Number : 69 Question Id : 1908892160 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

The area of Carnot cycle on T-S diagram represents

- (1) Heat absorbed by the source (2) Work done in a cycle  
(3) Heat rejected to the sink (4) Efficiency of the engine

**Options :**

1908898573. 1

1908898574. 2

1908898575. 3

1908898576. 4

**Question Number : 70 Question Id : 1908892161 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Under equilibrium conditions, the thermodynamic variable associated with black body radiation at temperature  $T$  which reduces to zero is

- (1) Entropy (2) Helmholtz free energy  
(3) Gibb's free energy (4) Pressure

**Options :**

1908898577. 1

1908898578. 2

1908898579. 3

1908898580. 4

**Question Number : 71 Question Id : 1908892162 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Which statistics will be applied to deuterons and  $\alpha$  particles?

(1) Bose Einstein

(2) Fermi Dirac

(3) Maxwell Boltzmann

(4) None

**Options :**

1908898581. 1

1908898582. 2

1908898583. 3

1908898584. 4

**Question Number : 72 Question Id : 1908892163 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

The total number of accessible states of  $N$  non interacting particles of spin  $1/2$  is

(1)  $2^N$

(2)  $N^2$

(3)  $2^{\frac{N}{2}}$

(4)  $N$

**Options :**

1908898585. 1

1908898586. 2

1908898587. 3

1908898588. 4

**Question Number : 73 Question Id : 1908892164 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Einstein's formula for heat capacity

- (1) Fails at higher temperature
- (2) Fails at lower temperature because it goes as  $T$  instead of  $T^3$
- (3) Fails at lower temperature because it decreases exponentially instead of  $T^3$
- (4) Falls at all temperature range

**Options :**

1908898589. 1

1908898590. 2

1908898591. 3

1908898592. 4

**Question Number : 74 Question Id : 1908892165 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

The ratio of two specific heats of a diatomic gas is

- (1) 1.66
- (2) 1.33
- (3) 1.40
- (4) 1.52

**Options :**

1908898593. 1

1908898594. 2

1908898595. 3

1908898596. 4

**Question Number : 75 Question Id : 1908892166 Question Type : MCQ Option Shuffling : No Is**

**Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

An oil bath kept at  $27^\circ\text{C}$  is being supplied heat at the rate of  $100\text{ Js}^{-1}$ . Assuming the process to be quasi-static, the rate of increase of entropy of the system is approximately

- (1)  $3.7\text{ JK}^{-1}\text{s}^{-1}$  (2)  $3.7\text{ JK}^{-1}\text{s}^{-2}$   
(3)  $0.33\text{ JK}^{-1}\text{s}^{-1}$  (4)  $0.33\text{ JK}^{-1}\text{s}^{-2}$

**Options :**

1908898597. 1

1908898598. 2

1908898599. 3

1908898600. 4

**Question Number : 76 Question Id : 1908892167 Question Type : MCQ Option Shuffling : No Is**

**Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Ten milligrams of a radioactive substance of life period 2 years is kept for four years. How much of the substance remained unchanged?

- (1) 5 mg (2) 2 mg  
(3) 2.5 mg (4) 0 mg

**Options :**

1908898601. 1

1908898602. 2

1908898603. 3

1908898604. 4

**Question Number : 77 Question Id : 1908892168 Question Type : MCQ Option Shuffling : No Is**

**Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**



What is second nearest neighbor distance in bcc crystal whose conventional unit cell parameter is  $a$  ?

(1)  $a$

(2)  $\frac{a}{2}$

(3)  $a\sqrt{2}$

(4)  $\frac{\sqrt{3}a}{2}$

**Options :**

1908898613. 1

1908898614. 2

1908898615. 3

1908898616. 4

**Question Number : 80 Question Id : 1908892171 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

In a simple cubic lattice  $d_{100} : d_{110} : d_{111}$  is

(1) 6:3:2

(2)  $6 : 3 : \sqrt{2}$

(3)  $\sqrt{6} : \sqrt{3} : \sqrt{2}$

(4)  $\sqrt{6} : \sqrt{3} : \sqrt{4}$

**Options :**

1908898617. 1

1908898618. 2

1908898619. 3

1908898620. 4

**Question Number : 81 Question Id : 1908892172 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

If the angle between the direction of incident X-ray and diffracted one is  $16^\circ$ , the angle of incidence (glancing) will be

- (1)  $32^\circ$  (2)  $24^\circ$   
(3)  $90^\circ$  (4)  $82^\circ$

**Options :**

1908898621. 1

1908898622. 2

1908898623. 3

1908898624. 4

**Question Number : 82 Question Id : 1908892173 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

If  $\vec{K}$  is wave vector of incident X-ray and  $\vec{G}$  be the reciprocal lattice vector then condition for Bragg reflections is given by

- (1)  $\vec{K} = \vec{G}$  (2)  $|\vec{K}| = |\vec{G}|$   
(3)  $2\vec{K} \cdot \vec{G} = G^2$  (4)  $\vec{K} = -\vec{G}$

**Options :**

1908898625. 1

1908898626. 2

1908898627. 3

1908898628. 4

**Question Number : 83 Question Id : 1908892174 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**



The temperature dependence of the electrical resistivity of a metal according to classical free electron theory

(1)  $\rho \propto T^2$

(2)  $\rho \propto T^{-1}$

(3)  $\rho \propto T^{1/2}$

(4)  $\rho \propto T^{-2}$

**Options :**

1908898629. 1

1908898630. 2

1908898631. 3

1908898632. 4

**Question Number : 84 Question Id : 1908892175 Question Type : MCQ Option Shuffling : No Is**

**Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

The Fermi level of an intrinsic semiconductor is pinned at the center of the band gap. The probability of occupation of the highest electron state in valence band at room temperature, will be

(1) Zero

(2) Between zero and half

(3) Half

(4) One

**Options :**

1908898633. 1

1908898634. 2

1908898635. 3

1908898636. 4

**Question Number : 85 Question Id : 1908892176 Question Type : MCQ Option Shuffling : No Is**

**Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

The form factor of a half wave rectifier is

(1)  $\frac{\pi}{2}$

(2)  $\frac{\pi}{\sqrt{2}}$

(3)  $\frac{\pi}{2\sqrt{2}}$

(4)  $\pi$

**Options :**

1908898637. 1

1908898638. 2

1908898639. 3

1908898640. 4

**Question Number : 86 Question Id : 1908892177 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Which of the following gates has the exact inverse output of the OR gate for all possible input combinations?

(1) AND

(2) NOT

(3) NOR

(4) NAND

**Options :**

1908898641. 1

1908898642. 2

1908898643. 3

1908898644. 4

**Question Number : 87 Question Id : 1908892178 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

The decimal equivalent of hexadecimal E 5 is

- (1) 279 (2) 229  
(3) 427 (4) 3000

**Options :**

1908898645. 1  
1908898646. 2  
1908898647. 3  
1908898648. 4

**Question Number : 88 Question Id : 1908892179 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

In case of wave function  $\psi = \frac{e^{ikr}}{r}$ , the probability current density is

- (1)  $\frac{\hbar k}{mr^2}$  (2)  $\frac{\hbar k}{mr}$   
(3)  $\frac{\hbar k}{r^2}$  (4)  $\frac{\hbar k}{r}$

**Options :**

1908898649. 1  
1908898650. 2  
1908898651. 3  
1908898652. 4

**Question Number : 89 Question Id : 1908892180 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

A particle is described by a wave function  $\psi(x) = e^{-|x|}$  in one dimension. The probability that it will be found in the region  $|x| \leq a, a > 0$  is

- (1)  $e^{-a}$  (2)  $e^{-2a}$   
(3)  $1 - e^{-a}$  (4)  $1 - e^{-2a}$

**Options :**

1908898653. 1  
1908898654. 2  
1908898655. 3  
1908898656. 4

**Question Number : 90 Question Id : 1908892181 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Two's complement (decimal) of the binary number 1000001 is

- (1) + 63 (2) - 63  
(3) + 62 (4) - 62

**Options :**

1908898657. 1  
1908898658. 2  
1908898659. 3  
1908898660. 4

**Question Number : 91 Question Id : 1908892182 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Two particles are moving towards each other with equal velocities  $c/2$ . Their velocity of approach will be

- (1)  $C$  (2)  $\frac{C}{2}$   
(3)  $\frac{4C}{5}$  (4)  $\frac{C}{4}$

**Options :**

1908898661. 1

1908898662. 2

1908898663. 3

1908898664. 4

**Question Number : 92 Question Id : 1908892183 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

If the momentum of an electron moving with a velocity  $0.9c$  is increased by 1% then the increase in its energy is

- (1) 1% (2) 0.9%  
(3) 0.81% (4) 0.5%

**Options :**

1908898665. 1

1908898666. 2

1908898667. 3

1908898668. 4

**Question Number : 93 Question Id : 1908892184 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

The phase-shift between input and output voltages of CE amplifier

- |          |          |
|----------|----------|
| (1) 90°  | (2) 120° |
| (3) 180° | (4) 270° |

**Options :**

1908898669. 1

1908898670. 2

1908898671. 3

1908898672. 4

**Question Number : 94 Question Id : 1908892185 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

The purpose of capacitors in a transistor amplifier is to

- |                            |                                     |
|----------------------------|-------------------------------------|
| (1) Protect the transistor | (2) Cool the transistor             |
| (3) Provide biasing        | (4) Couple or bypass a.c. component |

**Options :**

1908898673. 1

1908898674. 2

1908898675. 3

1908898676. 4

**Question Number : 95 Question Id : 1908892186 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**



For a transistor amplifier in common emitter configuration having load impedance of  $1\text{ k}\Omega$  ( $h_{fe} = 50$  and  $h_{oe} = 25 \times 10^{-6}\text{ S}$ ) the current gain is

- (1)  $-5.2$  (2)  $-15.7$   
(3)  $-24.8$  (4)  $-48.78$

**Options :**

1908898685. 1  
1908898686. 2  
1908898687. 3  
1908898688. 4

**Question Number : 98 Question Id : 1908892189 Question Type : MCQ Option Shuffling : No Is**

**Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Curie temperature is the temperature above which

- (1) a ferromagnetic material becomes paramagnetic  
(2) a paramagnetic material becomes diamagnetic  
(3) a ferromagnetic material becomes diamagnetic  
(4) a paramagnetic material becomes ferromagnetic

**Options :**

1908898689. 1  
1908898690. 2  
1908898691. 3  
1908898692. 4

**Question Number : 99 Question Id : 1908892190 Question Type : MCQ Option Shuffling : No Is**

**Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**



If  $\psi = \sqrt{\frac{2}{L}} \cos \frac{\pi x}{L} e^{-i\pi t/\hbar}$ , then  $\langle x \rangle$  in the limit  $-\frac{L}{2} < x < \frac{L}{2}$  is

(1)  $\frac{3}{4L}$

(2) 0

(3)  $\frac{1}{4L}$

(4)  $\frac{L}{2}$

**Options :**

1908898693. 1

1908898694. 2

1908898695. 3

1908898696. 4

**Question Number : 100 Question Id : 1908892191 Question Type : MCQ Option Shuffling : No**

**Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Which of the following phenomenon can be explained by quantum mechanical tunneling through the barrier?

(1)  $\alpha$ -decay

(2) emission of photo electrons from metal surface

(3)  $\gamma$ -decay

(4)  $\beta$ -decay

**Options :**

1908898697. 1

1908898698. 2

1908898699. 3

1908898700. 4