

**FIITJEE - INTERNAL PHASE TEST****PHYSICS, CHEMISTRY & MATHEMATICS****CODE: 100695****Time Allotted: 3 Hours****Maximum Marks: 255**

- Please read the instructions carefully. You are allotted 5 minutes specifically for this purpose.
- You are not allowed to leave the Examination Hall before the end of the test.

**INSTRUCTIONS**

**Caution: Question Paper CODE as given above MUST be correctly marked in the answer OMR sheet before attempting the paper. Wrong CODE or no CODE will give wrong results.**

**A. General Instructions**

1. Attempt ALL the questions. Answers have to be marked on the OMR sheets.
2. This question paper contains Three Parts.
3. **SECTION-I** is Physics, **SECTION -II** is Chemistry and **SECTION -III** is Mathematics.
4. Each **Section** is further divided into **Two Parts: Part-A & B** in the OMR.
5. Rough spaces are provided for rough work inside the question paper. No additional sheets will be provided for rough work.
6. Blank Papers, clip boards, log tables, slide rule, calculator, cellular phones, pagers and electronic devices, in any form, are not allowed.

**B. Filling of OMR Sheet**

1. Ensure matching of OMR sheet with the Question paper before you start marking your answers on OMR sheet.
2. On the OMR sheet, darken the appropriate bubble with **Blue/Black Ball Point Pen** for each character of your Enrolment No. and write in ink your Name, Test Centre and other details at the designated places.
3. OMR sheet contains alphabets, numerals & special characters for marking answers.

**C. Marking Scheme For All Two Parts.**

- (i) **PART-A (01-07)** contains 7 Multiple Choice Questions which have **One or More Correct** answer. For each question in the group **Q. 01 – 07** of **PART – A** you will be awarded  
*Full Marks: +4* If only the bubble(s) corresponding to all the correct options(s) is (are) darkened.  
*Partial Marks: +1* For darkening a bubble corresponding to **each correct option**, provided NO incorrect option is darkened.  
*Zero Marks: 0* If none of the bubbles is darkened.  
**Negative Marks: -1 In all other cases.**  
 For example, if **(A), (C) and (D)** are all the correct options for a question, darkening all these three will result in **+4 marks**; darkening only **(A) and (D)** will result in **+2 marks**; and darkening **(A) and (B)** will result in **-1** mark, as a wrong option is also darkened.
- (ii) **Part-A (08-14)** – Contains seven (07) multiple choice questions which have **ONLY ONE CORRECT** answer Each question carries **+3 marks** for correct answer and **-1 marks** for wrong answer
- (iii) **Part-A (15-18)** - This section contains Two paragraphs. Based on each table, there are Two multiple choice questions. Each question has **only one correct** answer and carries **+3 marks** for the correct answer. **There is no negative marking.**
- (iv) **Part-A (19-20)** – This section contains Two (02) List-Match Sets, each List-Match set has One (01) Multiple Choice Questions. Each List-Match set has two lists: List-I and List-II. FOUR options are given in each Multiple Choice Question based On List-I and List-II and **ONLY ONE** of these four options satisfies the condition asked in the Multiple Choice Question. Each question carries **+3 Marks** for correct combination chosen and **-1 mark** for wrong options chosen.
- (v) **Part-B (01-06)** contains six (06) Numerical based questions, the answer of which maybe positive or negative numbers or decimals to **Two decimal places** (e.g. 6.25, 7.00, -0.33, -.30, 30.27, -127.30) and each question carries **+3 marks** for correct answer. **There is no negative marking.**

Name of the Candidate : \_\_\_\_\_

Batch : \_\_\_\_\_ Date of Examination : \_\_\_\_\_

Enrolment Number : \_\_\_\_\_

BATCHES – Four Yr CRP428 (R &amp; W)\_PT-1

## SECTION – I (PHYSICS)

### PART – A

#### Multiple Correct Choice Type

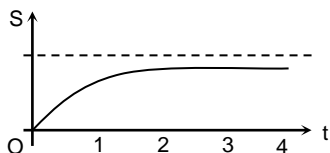
This section contains 7 multiple choice questions. Each question has four choices (A), (B), (C) and (D) out of which ONE or MORE THAN ONE are correct.

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- Which of the following are vector quantities?  
(A) Time (B) Displacement  
(C) Speed (D) Acceleration
  - Choose the correct statement(s) regarding the motion of a particle  
(A) if instantaneous velocity of a particle is zero, then its instantaneous acceleration will necessarily be zero  
(B) if instantaneous velocity of a particle is zero, then it can have instantaneous acceleration  
(C) a situation is possible in which instantaneous velocity of a particle is never zero but average velocity in that interval is zero  
(D) A situation is possible in which the speed of a particle is never zero but average speed in that interval is zero
  - Consider the motion of the tip of the minute hand of a clock in 1h.  
(A) the displacement is zero. (B) the distance covered is zero.  
(C) the average speed is zero. (D) the average velocity is zero.
  - In which of the following cases the distance and magnitude of displacement are always equal for any time?  
(A) A block moving down a long incline.  
(B) A ball is released from rest from the top of high building.  
(C) A ball projected up from the ground.  
(D) A particle moving along a straight line with initial velocity zero and constant acceleration.
  - At  $t = 0$ , an arrow is fired vertically upwards with a speed of 100 m/s. A second arrow is fired vertically upwards with the same speed at  $t = 5$  s. Then  
(A) The two arrows will be at the same height above the ground at  $t = 5$  s.  
(B) The two arrows will reach back their starting points at  $t = 20$  s and at  $t = 25$  s.  
(C) The ratio of the speeds of the first and second arrows at  $t = 20$  s will be 2 : 1  
(D) The maximum height attained by either arrow will be 1000 m.
- 

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6. The displacement of a particle as a function of time is shown in the figure. It indicates



- (A) The particle starts with a certain velocity, but the motion is retarded and finally the particle stops
- (B) The velocity of the particle decreases.
- (C) The acceleration of the particle is in opposite direction to the velocity
- (D) The particle starts with a constant velocity, the motion is accelerated and finally the particle moves with another constant velocity

7. A car covers 30 km in 25 min and next 30 km in 35 min. The average speed for entire journey is

- (A) 1 km/h
- (B) 60 km/h
- (C) 60 km/min
- (D) 1 km/min

### Single Correct Choice Type

This section contains 7 multiple choice questions. Each question has four choices (A), (B), (C) and (D) out of which ONLY ONE option is correct.

8. Two spheres having masses 10 g and 25 g are projected horizontally from the same height with velocities  $V_1$  and  $V_2$  and they fall to the ground in time intervals  $t_1$  and  $t_2$  respectively.

If the ratio  $V_1 : V_2$  is 1 : 3 the ratio  $t_1 : t_2$  will be

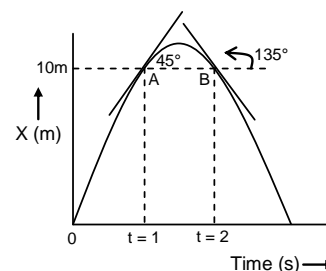
- (A) 10 : 25
- (B) 25 : 10
- (C) 1 : 1
- (D) 1 : 3

9. A particle moving on a straight line ultimately comes to rest. What is the angle between its initial velocity and acceleration?

- (A) zero
- (B)  $\pi/4$
- (C)  $\pi/2$
- (D)  $\pi$

10. The displacement time curve of a particle moving along a straight line is shown. Tangent at A and B make angles of  $45^\circ$  and  $135^\circ$  with position X-axis respectively. The average acceleration of the particle during  $t = 1, t = 2$  is

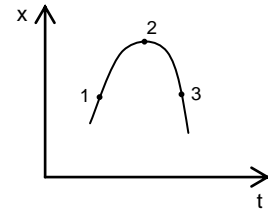
- (A)  $-2 \text{ m/s}^2$
- (B)  $1 \text{ m/s}^2$
- (C)  $-1 \text{ m/s}^2$
- (D) Zero



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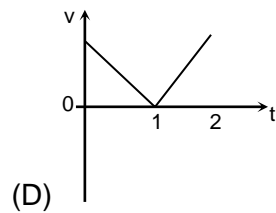
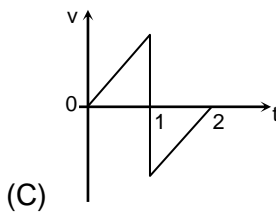
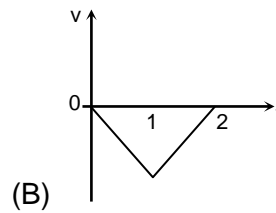
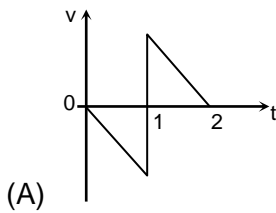
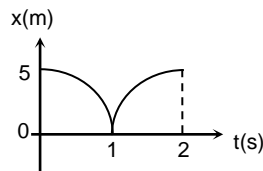
11. A body when projected up with an initial velocity  $u$  goes to a height  $h$  in time  $t$  and then comes back at the point of projection. The correct statement is  
 (A) the average velocity is  $2h/t$ .  
 (B) the acceleration is zero.  
 (C) the final velocity on reaching the point of projection is  $2u$ .  
 (D) the displacement is zero.

12. The displacement time curve of a particle moving along a straight line is as shown in fig. At which of the point marked the object is speeding up  
 (A) 1  
 (B) 2  
 (C) 3  
 (D) None of these



13. A train 100 m long traveling at  $40 \text{ ms}^{-1}$  overtakes another train 200 m long traveling at  $30 \text{ ms}^{-1}$ . The time taken by the first train to pass the second train is:  
 (A) 30 sec  
 (B) 40 sec  
 (C) 50 sec  
 (D) 60 sec

14. The displacement-time graph of moving particle with constant acceleration is shown in figure. The velocity-time graph is given by



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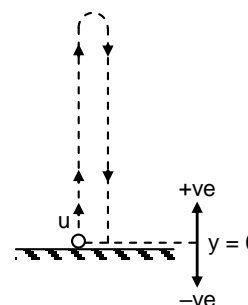
**Comprehension Type**

This section contains 2 Paragraphs which has two multiple choice questions each. Each question has four choices (A), (B), (C) and (D) out of which ONLY ONE option is correct.

**Paragraph - I (15-16)**

A ball is thrown up with initial velocity  $u = 50 \text{ ms}^{-1}$  as shown in the figure. The origin and positive and negative directions are also indicated in the figure. Neglect air resistance and take  $g = 10 \text{ ms}^{-2}$

Based on above information, answer the following questions:



15. How much time the ball takes to reach to a height which is half of the maximum height?  
 (A) 1.46 s (B) 2.5 s  
 (C) 3 s (D) 1.82 s
16. Determine the distance travelled by the ball in 3rd second of its motion.  
 (A) Zero (B) 45 m  
 (C) 25 m (D) 80 m

**Paragraph -II (17-18)**

A rocket is fired vertically up from the ground with a resultant acceleration of  $10 \text{ m/s}^2$  upward. The fuel is finished in 1 minute and it continues to move up ( $g = 10 \text{ m/s}^2$ )

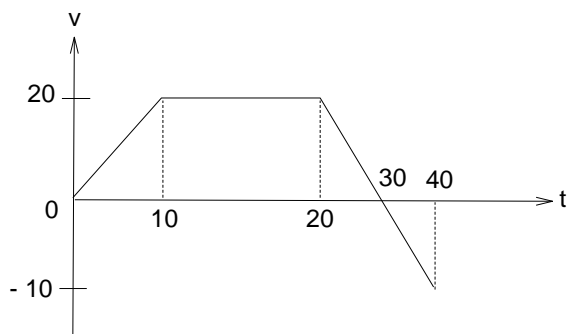
17. Find the maximum height reached by rocket from ground.  
 (A) 18 km (B) 25 km  
 (C) 36 km (D) 40 km
18. Find the time from initial in which rocket will be again at ground is  $(120+60\sqrt{2}) \text{ s}$ .  
 (A)  $60(2 + \sqrt{2}) \text{ sec}$ . (B)  $120(2 + \sqrt{2}) \text{ sec}$ .  
 (C) 120 sec. (D) 60 sec.

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**Match Type**

This section contains Two (02) List-Match Sets, each List-Match set has One (01) Multiple Choice Questions. Each List-Match set has two lists: List-I and List-II. FOUR options are given in each Multiple Choice Question based On List-I and List-II and ONLY ONE of these four options satisfies the condition asked in the Multiple Choice Question.

19. 1. In the figure shown velocity – time graph of a particle initially at  $x = +5$  m is shown



Now match the following:

List - I		List - II	
(A)	Distance travelled by particle from $t = 0$ to $t = 15$ sec. in meter	(P)	20
(B)	Magnitude of average acceleration from $t = 20$ to $t = 40$ sec in $m/s^2$	(Q)	200
(C)	Position of particle at $t = 10$ sec in meter	(R)	1.5
(D)	Average velocity from $t = 10$ sec to $t = 20$ sec in (m/s)	(S)	105

The correct option is:

- (A)  $A \rightarrow Q; B \rightarrow P; C \rightarrow S; D \rightarrow R$                       (B)  $A \rightarrow Q; B \rightarrow R; C \rightarrow S; D \rightarrow P$   
 (C)  $A \rightarrow S; B \rightarrow R; C \rightarrow Q; D \rightarrow P$                       (D)  $A \rightarrow Q; B \rightarrow R; C \rightarrow P; D \rightarrow S$

20. Match the parameters of a body projected vertically upwards with a velocity  $v_0$  and it returns to ground given in List-I to their corresponding values given in List-II.

List - I		List - II	
(A)	Average velocity	(P)	$v_0/2$
(B)	Time of ascent	(Q)	$2v_0/g$
(C)	Time of ascent + time of decent	(R)	$v_0/g$
(D)	Average speed	(S)	Zero for round the trip

The correct option is:

- (A)  $A \rightarrow P; B \rightarrow R; C \rightarrow Q; D \rightarrow S$                       (B)  $A \rightarrow R; B \rightarrow P; C \rightarrow Q; D \rightarrow S$   
 (C)  $A \rightarrow S; B \rightarrow R; C \rightarrow Q; D \rightarrow P$                       (D)  $A \rightarrow Q; B \rightarrow R; C \rightarrow P; D \rightarrow S$

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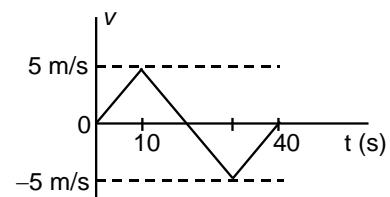
**PART – B**  
**Numerical Based**

**This section contains 6 questions. The answer of which maybe positive or negative numbers or decimals (e.g. 6.25, 7.00, -0.33, -.30, 30.27, -127.30) and each question carries +3 marks for correct answer.**

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1. A racing car has a uniform acceleration of  $4\text{m/s}^2$ . What distance will it cover in 2s starting from rest (in m).
2. A ball is thrown vertically upward with velocity 20 m/s. Total distance covered by ball before striking the ground is  $10n$  meter. The value of  $n$  is \_\_\_\_\_.
3. A ball is thrown vertically upwards. It rises to a height of 10 m and comes back to the thrower. Find distance travelled by ball in 1.5 sec in metre. [ $g = 10\text{ m/s}^2$ ]
4. A car moving along a long straight road with a speed of 10 m/s is brought to rest within 10 seconds after applying the brakes. What is the magnitude of the retardation of the car?

5. From the velocity-time plot shown in figure, find the average velocity during 40s.



6. What is the speed with which a stone is projected vertically upwards from the ground if it attains a maximum height of 3.2 m? ( $g = 10\text{ m/s}^2$ )

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## SECTION – II (CHEMISTRY)

### PART – A

#### Multiple Correct Choice Type

This section contains 7 multiple choice questions. Each question has four choices (A), (B), (C) and (D) out of which ONE or MORE THAN ONE are correct.

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- According to kinetic molecular theory  
(A) matter is made up of small particles that may be atoms, molecules or ions.  
(B) the empty space (gap) between the particles is known as intermolecular space  
(C) molecules exert an attractive force upon each other.  
(D) the molecules always remain fixed.
- Select the correct statement about water  
(A) water can exist in all the three forms of matter  
(B) the b.p. of water is 100°C  
(C) water can be compressed easily  
(D) all the above are correct
- What is correct on the basis of phenomena of evaporation?  
(A) It cause cooling effect  
(B) It is favoured by decrease of temperature  
(C) Evaporation is a surface phenomena  
(D) Evaporation increases with increase of the temperature
- Which of the following compounds undergoes sublimation?  
(A) Iodine  
(B) Ammonium chloride  
(C) Sodium chloride  
(D) Camphor
- Choose the correct statement(s) from the following:  
(A) volume of a gas expands on heating  
(B) more than two gases cannot diffuse into each other  
(C) the intermolecular distance in solid state of a substance is larger than that in the liquid state  
(D) air can be compressed
- Which of the following is/are the characteristic of particles of matter?  
(A) They are in a state of constant motion.  
(B) There is certain space between particles in most cases.  
(C) They attract each other in some cases.  
(D) They are very small in size.
- Which of the following factor(s) favour condensation of the vapours of a substance?  
(A) Increasing pressure  
(B) Decreasing temperature  
(C) Decreasing pressure  
(D) Increasing temperature

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*Space For Rough Work*



**Single Correct Choice Type**

This section contains 7 multiple choice questions. Each question has four choices (A), (B), (C) and (D) out of which ONLY ONE option is correct.

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8. Diamond (contains carbon) is a crystalline solid. Choose correct statement(s) regarding it.  
(I) Atoms are the building block of the solid.  
(II) The carbon atoms are orderly arranged through out the crystal.  
(III) It is an ionic solid.  
(IV) It can be compressed by apply pressure.  
Choose the correct choices  
(A) only I (B) I, II, IV  
(C) I, II (D) II, III
9. When a gas is cooled, the temperature falls and  
(A) energy is lost by particles  
(B) intermolecular space decreases  
(C) intermolecular force of attraction increases  
(D) all of the above
10. Which of the following is likely to happen when we decrease the inter-particle space in a substance?  
(A) an increase in volume occurs.  
(B) a decrease in volume occurs  
(C) an increase in mass of substance occurs  
(D) a decrease in mass of substance occurs.
11. Volume of a gas at a particular temperature and on atmospheric pressure is 200 ml. Keeping the temperature constant if pressure is increased to 5 atmosphere, then volume of the gas will be  
(A) 100 ml (B) 40 ml  
(C) 200 ml (D) 205 ml
12. Dry ice is produced under  
(A) Low pressure and high temperature (B) High pressure and low temperature  
(C) Low pressure and low temperature (D) High pressure and high temperature
13. In case of solids the particles have  
(A) vibratory motion (B) rotatory motion  
(C) translatory motion (D) all these three types of motion
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*Space For Rough Work*

14. The pressure exerted by an ideal gas in a 100 L container is P atm at TK. What pressure will the gas exert if it is transferred to a 10 L container at same temperature?

- (A)  $\frac{P}{10}$  atm (B) 10 P atm  
 (C)  $\frac{P}{2}$  atm (D) 2 P atm

### Comprehension Type

This section contains 2 Paragraphs which has two multiple choice questions each. Each question has four choices (A), (B), (C) and (D) out of which ONLY ONE option is correct.

#### Paragraph - I (15-16)

O <sub>2</sub>	CO <sub>2</sub>	N <sub>2</sub> O	SO <sub>3</sub>
( I )	( II )	( III )	( IV )

Equal volume of four vessels contain the given gases. The number of molecules of the gases are same in all the vessel. The vessels are closed. The gases exhibit their normal properties like diffusion, formation of pressure etc. Rate of diffusion and Liquefaction varies directly with molecular mass of the gas.

(At mass H = 1, C = 12, N = 14, O = 16)

Answer the following questions on the basis of above write up.

15. Which of the two gases diffuse at the same rate at constant temperature and pressure?  
 (A) O<sub>2</sub> and CO<sub>2</sub> (B) CO<sub>2</sub> and N<sub>2</sub>O  
 (C) N<sub>2</sub>O and SO<sub>3</sub> (D) O<sub>2</sub> and SO<sub>3</sub>
16. Which of the following vessel contains the heaviest gas molecules?  
 (A) I (B) II  
 (C) III (D) IV

#### Paragraph –II (17-18)

Water H <sub>2</sub> O	Ether CH <sub>3</sub> OCH <sub>3</sub>	Alcohol C <sub>2</sub> H <sub>5</sub> OH	Hydrogen peroxide H <sub>2</sub> O <sub>2</sub>
( I )	( II )	( III )	( IV )

The order of boiling point of the liquids is given as follows:

$$IV > I > III > II$$

Answer the following questions on the basis of above write up.

17. The liquid of which vessel can cause cooling easily?  
 (A) I (B) II  
 (C) III (D) IV

*Space For Rough Work*

18. Which liquid has the strongest intermolecular force?

- (A) I (B) II  
(C) III (D) IV

### Match Type

This section contains Two (02) List-Match Sets, each List-Match set has One (01) Multiple Choice Questions. Each List-Match set has two lists: List-I and List-II. FOUR options are given in each Multiple Choice Question based On List-I and List-II and ONLY ONE of these four options satisfies the condition asked in the Multiple Choice Question.

19. Match the column

Column – I (Characteristics)		Column – II (States of matter)	
(a)	Highly compressible form of matter and has a low density	(p)	Plasma
(b)	Occupy space have a definite shape and definite volume	(q)	Liquid
(c)	Less rigid, can flow and take the shape of the container.	(r)	Solid
(d)	Highly energetic and highly excited particles state	(s)	Gas

- (A) a – s, b – r, c – q, d – p (B) a – p, b – q, c – r, d – s  
(C) a – r, b – s, c – p, d – q (D) a – q, b – r, c – p, d – s

20. Match the physical processes mentioned in column-I with their characteristics mentioned in column-II.

Column – I		Column – II	
(a)	Melting	(p)	Heat is evolved
(b)	Boiling	(q)	Heat is absorbed
(c)	Vapourisation	(r)	Liquid changes to gas
(d)	Condensation	(s)	Gas or vapours change to liquid

- (A) a → p, b → q, c → r, d → pq (B) a → q, b → qr, c → qr, d → ps  
(C) a → ps, b → s, c → pq, d → ps (D) a → rs, b → pr, c → qs, d → rs

*Space For Rough Work*

**PART – B**  
**Numerical Based**

**This section contains 6 questions. The answer of which maybe positive or negative numbers or decimals (e.g. 6.25, 7.00, -0.33, -.30, 30.27, -127.30) and each question carries +3 marks for correct answer.**

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1. An unknown gas diffuse four times faster than oxygen. Calculate molecular mass of the unknown gas
2. A sample of gas occupies 10 litre under a pressure of 1 atm. What will be its volume (in litres) if the Pressure is increased to 2 atm. Assume that the temp of gas does not change
3. A sample of water was heated from 10°C to 18°C. Find out the rise in temperature in an Kelvin scale.
4. The normal boiling point of a liquid is 80°C. What is the vapour pressure of the liquid at this temperature in atm unit?
5. The volume of a gas becomes 16 litre when the pressure is reduced to half of its initial value at constant temperature. What was the initial volume of the gas in litre unit?
6. How many of the following substances can be confined in container of any volume?  
Glucose, Ozone, Graphite, Sulphur dioxide, Caustic soda, Nitrogen, Nitric oxide, Phosphorus, Ammonia.

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*Space For Rough Work*

**SECTION – III (MATHEMATICS)****PART – A****Multiple Correct Choice Type**

This section contains 7 multiple choice questions. Each question has four choices (A), (B), (C) and (D) out of which ONE or MORE THAN ONE are correct.

- Which of the following is/are rational number?  
 (A)  $\sqrt[3]{32}$  (B)  $\frac{22}{7}$   
 (C)  $\pi$  (D)  $\sqrt{0.4}$
- If  $\sqrt[3]{75} = \sqrt[4]{45} = \sqrt[5]{15}$ , then which of the statement(s) is/are **NOT** true ?  
 (A)  $x + y = 2z$  (B)  $x + y = 3z$   
 (C)  $x - y = 2z$  (D)  $x - y = 3z$
- If  $x$  is a positive real number such that  $x^2 + \frac{1}{x^2} = \frac{17}{4}$  then which of the following is/are true?  
 (A)  $x + \frac{1}{x} = \frac{5}{2}$  (B)  $x + \frac{1}{x} = \frac{-5}{2}$   
 (C)  $x^3 + \frac{1}{x^3} = \frac{65}{8}$  (D)  $x^3 + \frac{1}{x^3} = \frac{-65}{8}$
- A number  $x$  is a rational number if there exists integers  $p$  and  $q$  such that  $x = \frac{p}{q}$ . This is the definition of rational numbers in which  
 (A) Both  $p$  and  $q$  can be zero (B) both  $p$  and  $q$  should not be zero  
 (C)  $p$  can be zero but not  $q$  (D)  $q$  can be zero but not  $p$
- The expression  $(5a - 3b)^3 + (3b - 7c)^3 - (5a - 7c)^3$  is divisible by  
 (A)  $(5a + 3b + 7c)$  (B)  $(5a - 3b - 7c)$   
 (C)  $(3b - 7c)$  (D)  $(7c - 5a)$
- In a parallelogram ABCD, if bisector of  $\angle A$  also bisects BC at X then which of the following is/are true?  
 (A)  $AD = 2AB$  (B)  $\angle AXD = 90^\circ$   
 (C)  $\angle AXD = 60^\circ$  (D)  $\angle CDX = \angle ADX$

*Space For Rough Work*

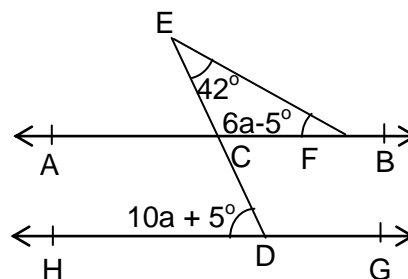
7. If  $a^m \times a^n = a^{mn}$ , then which of the following is/are true?
- (A)  $m(n-2) + n(m-2) = 0$  (B)  $m(n-2) + n(m-2) = -2$   
 (C)  $\frac{1}{m} + \frac{1}{n} = 2$  (D)  $\frac{1}{m} + \frac{1}{n} = 1$

**Single Correct Choice Type**

This section contains 7 multiple choice questions. Each question has four choices (A), (B), (C) and (D) out of which ONLY ONE option is correct.

8. If  $x + 5$  is a factor of  $x^3 - 20x + 5k$  then  $k =$   
 (A)  $-5$  (B)  $5$   
 (C)  $3$  (D)  $-3$
9. The value of  $0.\overline{272} + 0.\overline{1363}$  is  
 (A)  $\frac{3}{22}$  (B)  $\frac{41}{100}$   
 (C)  $\frac{1}{2}$  (D)  $\frac{9}{22}$
10. ABCD is a rhombus in which altitude from D to side AB bisects AB. Then  $\angle D$  of the rhombus is:  
 (A)  $60^\circ$  (B)  $90^\circ$   
 (C)  $120^\circ$  (D)  $135^\circ$
11. The descending order of  $2^{1/2}$ ,  $3^{1/3}$  and  $5^{1/6}$  is  
 (A)  $5^{1/6} > 3^{1/3} > 2^{1/2}$  (B)  $2^{1/2} > 3^{1/3} > 5^{1/6}$   
 (C)  $2^{1/2} > 5^{1/6} > 3^{1/3}$  (D)  $3^{1/3} > 2^{1/2} > 5^{1/6}$
12. If  $5^{2m-1} = 25^{m-1} + 100$ , then the value of  $3^{2+m}$  is  
 (A)  $27$  (B)  $81$   
 (C)  $9$  (D)  $343$

13. In the given figure,  $AB \parallel HG$  then the value of 'a' is  
 (A)  $8$  (B)  $9$   
 (C)  $7.5$  (D)  $10$



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14. The polynomials  $ax^3 + 3x^2 - 13$  and  $2x^3 - 5x + a$  are divided by  $x + 2$ . If remainder in each case is the same, the value of  $a$  is
- (A)  $\frac{4}{9}$  (B)  $\frac{7}{9}$   
 (C)  $\frac{2}{9}$  (D)  $\frac{5}{9}$

**Comprehension Type**

This section contains 2 Paragraphs which has two multiple choice questions each. Each question has four choices (A), (B), (C) and (D) out of which ONLY ONE option is correct.

**Paragraph - I (15-16)**

If  $A = 3^{333}$ ,  $B = 3^{3^{33}}$ ,  $C = 3^{3^{33}}$  and  $D = 3^{3^{33}}$  then

15.  $B \times D =$
- (A)  $3^{3^{60}}$  (B)  $3^{126}$   
 (C)  $3^{3^{27} \times 730}$  (D) None of these
16. Which of the following is correct?
- (A)  $B > A > C > D$  (B)  $B > D > C > A$   
 (C)  $B > D > A > C$  (D)  $D > B > A > C$

**Paragraph -II (17-18)**

If  $f(x) = x^3 + px + q$  is divisible by  $x^2 + x - 2$ , then

17. Find value of  $p + q$
- (A) 2 (B) -2  
 (C) 1 (D) -1
18. Find the remainder when  $f(x)$  is divided by  $x + 1$
- (A) 5 (B) 0  
 (C) 4 (D) 8

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## Match Type

This section contains Two (02) List-Match Sets, each List-Match set has One (01) Multiple Choice Questions. Each List-Match set has two lists: List-I and List-II. FOUR options are given in each Multiple Choice Question based On List-I and List-II and ONLY ONE of these four options satisfies the condition asked in the Multiple Choice Question.

19. Match the column I & column II.

Column I		Column II	
(A)	If $X^{x^{3/2}} = (X^{3/2})^x$ then $x =$	(P)	1
(B)	If $(a^2 + b^2)^3 = (a^3 + b^3)^2$ and $ab \neq 0$ then the numerical value of $\frac{a}{b} + \frac{b}{a}$ is equal to	(Q)	$\frac{2}{3}$
(C)	If $a + \frac{1}{b} = 3$ , $b + \frac{1}{c} = 4$ , $c + \frac{1}{a} = \frac{9}{11}$ then find the value of $a \times b \times c$	(R)	$\frac{9}{4}$
(D)	$(5^{1/3} - 2^{1/3})(4^{1/3} + 10^{1/3} + 25^{1/3}) = ?$	(S)	3

(A) A-Q; B-P; C-R; D-S

(B) A-R; B-Q; C-P; D-S

(C) A-R; B-S; C-P; D-Q

(D) A-S; B-R; C-Q; D-P

20. Match the column I & column II.

Column I		Column II	
(A)	If $x + \frac{1}{x} = \sqrt{5}$ , then $\frac{x^8 + 1}{x^6 + 7x^4 + x^2} =$	(P)	$\frac{7}{10}$
(B)	If $64^{2x-5} = 4 \times 8^{x-5}$ , then the value of $x$ is	(Q)	2
(C)	If $6a - \frac{1}{7a} = 18$ , then $49a^2 + \frac{1}{36a^2} = ?$	(R)	$\frac{17}{9}$
(D)	If $x + \frac{1}{x} = 2$ then $x^{10} + \frac{1}{x^{10}} =$	(S)	$\frac{1330}{3}$

(A) A-Q; B-R; C-S; D-P

(B) A-P; B-S; C-R; D-Q

(C) A-P; B-Q; C-S; D-R

(D) A-P; B-R; C-S; D-Q

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**PART – B**  
**Numerical Based**

**This section contains 6 questions. The answer of which maybe positive or negative numbers or decimals (e.g. 6.25, 7.00, -0.33, -.30, 30.27, -127.30) and each question carries +3 marks for correct answer.**

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1. The value of  $\sqrt[3]{20+14\sqrt{2}} + \sqrt[3]{20-14\sqrt{2}}$  is \_\_\_\_\_
  2. Let  $f(x)$  be a quadratic polynomial with  $f(2) = 10$  and  $f(-2) = -2$ . Then find the coefficient of  $x$  in  $f(x)$
  3. If  $x^3 - 3x^2 + 3x + 7 = (x+1)(ax^2 + bx + c)$ , then find the value of  $(a+b+c)$
  4. If  $(x+2)(x+5)$  is the HCF of the polynomials  $(x+2)(x^2 + 6x + a)$  and  $(x+5)(x^2 + 8x + b)$ , then find the value of  $b - a$ .
  5. If  $a^2 + b^2 + c^2 + 6b + 8c - 2a = -26$  then find the value of  $2a + 3b - 4c$
  6. Given  $a$  and  $b$  are real numbers such that  $2^{\frac{a}{b}+1} - 2^{\frac{a}{b}-1} = 12$  then find value of  $\frac{12ab}{a^2 + 27b^2}$
- 

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## TEST CODE: 100695

### ANSWER KEYS

#### Physics

##### Part – A

1. BD	2. BC	3. AD	4. ABD
5. BC	6. ABC	7. BD	8. C
9. D	10. A	11. D	12. C
13. A	14. A	15. A	16. C
17. C	18. A	19. B	20. C

##### Part – B

1. 8	2. 4	3. 6.25	4. 1
5. 0	6. 8		

#### Chemistry

##### Part – A

1. AB(bonus)	2. AB	3. ACD	4. ABD
5. AD	6. ABCD	7. AB	8. C
9. D	10. B	11. B	12. B
13. A	14. B	15. B	16. D
17. B	18. D	19. A	20. B

##### Part – B

1. 2	2. 5	3. 8	4. 1
5. 8	6. 5		

#### Mathematics

##### Part – A

1. BD	2. ACD	3. AC	4. C
5. CD	6. ABD	7. AD	8. B
9. D	10. C	11. D	12. B
13. A	14. D	15. C	16. B
17. D	18. C	19. B	20. D

##### Part – B

1. 4	2. 3	3. 4	4. 7
5. 9	6. 1		

# Answers & Solutions

## SECTION – I (PHYSICS)

### PART – A

1. **BD**

Sol. Displacement and acceleration are vector.  
Hence, BD.

2. **BC**

Sol. (B) When any object is at highest point then  $v = 0$  but  $a = g$  downward  
(C) When object return to initial position  $v_{avg} = 0$ , but instantaneous velocity is not always zero.

3. **AD**

Sol. As displacement becomes zero chance average velocity is also zero.

4. **ABD**

Sol. Distance = |Disp| when object travels in straight line in a fixed direction.

5. **BC**

Sol.  $h = 100t - \frac{1}{2}gt^2$   
 $T = \frac{2v}{g} = \frac{2 \times 100}{10} = 20s$

6. **ABC**

Sol. Slope of  $s - t$  graph given information about velocity.  
At  $t \rightarrow \infty$ , slope = 0  $\Rightarrow$  velocity = 0  
slope continuously decreases  $\Rightarrow$  velocity decreases  
velocity is decreasing  $\Rightarrow$  acceleration is negative

7. **BD**

Sol. Average speed =  $\frac{\text{Total distance covered}}{\text{Total time}}$

8. **C**

Sol.  $t = \sqrt{\frac{2h}{g}}$   
Hence,  $\frac{t_1}{t_2} = \frac{\sqrt{\frac{2h}{g}}}{\sqrt{2h/g}} = 1 : 1$

9. **D**

Sol. Acceleration is opposite to velocity.  
Hence, angle is  $\pi$ .

10. **A**

Sol.  $V_A = \tan 45^\circ = 1$   
 $V_B = \tan 135^\circ = -1$   
 $a = \frac{V_B - V_A}{t_B - t_A} = \frac{-1 - 1}{2 - 1} = -2 \text{ m/s}^2$

11. **D**

12. **C**

Sol. The object is speeding up at position 3.

13. **A**

Sol.  $t = \frac{\text{Distance}}{v_{12}} = \frac{300}{(40-30)} = \frac{300}{10} = 30 \text{ sec.}$

14. **A**

Sol. Velocity -ve and decreasing from 0 to 1 sec.  
Velocity +ve and decreasing from 1 to 2 sec.

15. **A**

Sol.  $h_{\max} = \frac{50 \times 50}{2 \times 10} = 125 \text{ m}$   
 $\frac{125}{2} = 50 \times t - \frac{1}{2}gt^2$  ;  $t = 1.46 \text{ s}$

16. **C**

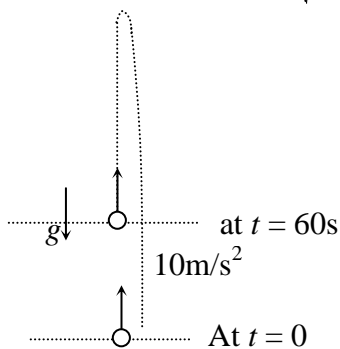
Sol.  $s_{3\text{rd}} = 50 - \frac{g}{2}(2 \times 3 - 1) = 25 \text{ m}$

17. **C**

Sol. Total height =  $\frac{1}{2} \times 10 \times (60)^2 + \frac{(10 \times 60)^2}{2 \times 10} = 36000 \text{ m} = 36 \text{ km}$

18. **A**

Sol. Total time =  $60 + 60 + \sqrt{\frac{2 \times 36000}{10}}$



$$= 60\text{s} + 60\text{s} + 60\sqrt{2}\text{s}$$

$$= (120 + 60\sqrt{2})\text{s}$$

19. **B**

Sol. (A)  $S = \frac{1}{2} \times (15 + 5) \times 20 = 200 \text{ m}$

(B)  $a = \frac{v_2 - v_1}{t_2 - t_1} = \frac{30}{20} = 1.5 \text{ m/s}^2$

(C)  $S - 5 = \frac{1}{2} \times (10) \times 20 \Rightarrow S = 105 \text{ m}$

(D)  $v_{\text{avg}} = \frac{20 \times 10}{10} = 20 \text{ m/s}$

20. **C****PART – B**1. **8**

Sol.  $s = \frac{1}{2} \times 4 \times 2 \times 2 = 8 \text{ m}$

2. **4**

Sol.  $S = 2 \times \frac{v_o^2}{2g} = 2 \times \frac{20 \times 20}{2 \times 10} = 40 = 4 \times 10$

$n = 4.$

3. **6.25**

Sol. Distance =  $\left( \frac{10^2}{2 \times 10} \right) + \frac{1}{2} \times 10 \times (0.5)^2$   
 $= 5 + 1.25$   
 $= 6.25 \text{ m.}$

4. **1**

Sol.  $a = \frac{0 - 10}{10} = -1.$

5. **0**6. **8**

Sol.  $u = \sqrt{2gh}$

## SECTION – II (CHEMISTRY)

### PART – A

1. AB  
Sol. According to kinetic molecular theory matter is made up of small particles that may be atoms, molecules or ions & the empty space (gap) between the particles is known as intermolecular space
2. AB  
Sol. The correct statement about water is that water can exist in all the three forms of matter & the b.p. of water is 100°C
3. ACD  
Sol. Evaporation causes cooling effect, it is a surface phenomena, its rate increases with increase of the temperature.
4. ABD  
Sol. Iodine, Ammonium chloride & camphor undergoes sublimation.
5. AD  
Sol. Gases expand on heating and are compressible.
6. ABCD  
Sol. The characteristics of particles of matter are  
(i) They are in a state of constant motion.  
(ii) There is certain space between particles in most cases.  
(iii) They attract each other in some cases.  
(iv) They are very small in size.
7. AB  
Sol. Increase in pressure and decrease in temperature favours condensation.
8. C  
Sol. Diamond is a crystalline solid & allotrope of carbon.
9. D  
Sol. When a gas is cooled, the temperature falls and energy is lost by particles, intermolecular space decreases & intermolecular force of attraction increases.
10. B  
Sol. Decrease in volume occurs when we decrease the inter-particle space in a substance.
11. B  
Sol.  $P_1V_1 = P_2V_2$
12. B  
Sol. Dry ice is produced under high pressure and low temperature.
13. A  
Sol. Solids only possess vibratory motion.
14. B  
Sol.  $P_1V_1 = P_2V_2$
15. B  
Sol. Mol. Wt of  $\text{CO}_2$  &  $\text{N}_2\text{O}$  is 44.
16. D  
Sol. Highest mol. Wt have highest weight.

17. B

Sol. The boiling point of Ether( $\text{CH}_3\text{OCH}_3$ ) is low so it cause cooling easily.

18. D

Sol. The b.pt of Hydrogen peroxide( $\text{H}_2\text{O}_2$ ) is highest so it has strongest intermolecular force.

19. A

Sol. Highly compressible form of matter and has a low density → Gas  
Occupy space have a definite shape and definite volume → Solid  
Less rigid, can flow and take the shape of the container → Liquid  
Highly energetic and highly excited particles state → Plasma

20. B

Sol. Melting → Heat is absorbed

Boiling → Heat is absorbed, liquid changes to gas

Vapourisation → Heat is absorbed, liquid changes to gas

Condensation → Heat is evolved, Gas or vapours change to liquid

### PART – B

1. 2

Sol.  $\frac{r_1}{r_2} = \sqrt{\frac{M_2}{M_1}}$

2. 5

Sol.  $P_1V_1 = P_2V_2$

3. 8

Sol.  $K = 273 + t^\circ\text{C}$

4. 1

Sol. The vapour pressure of the liquid at this temperature is 1 atm.

5. 8

Sol.  $P_1V_1 = P_2V_2$

6. 5

Sol. Gases can be confined in container of any volume ozone, sulphur dioxide, nitrogen, nitric oxide & Ammonia.

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*Space For Rough Work*

**SECTION – III (MATHEMATICS)****PART – A**

1. BD

Sol.  $\sqrt{0.4} = \sqrt{\frac{4}{9}} = \frac{2}{3}$

So,  $\frac{22}{7}$  and  $\frac{2}{3}$  are rational numbers.

2. ACD

Sol.  $\sqrt[x]{75} = \sqrt[y]{45} = \sqrt[z]{15} = k$  (Let)

$$\Rightarrow 75 = k^x$$

$$45 = k^y$$

$$15 = k^z$$

$$\text{Since } 15^3 = 45 \times 75 \Rightarrow k^{3z} = k^y \times k^x$$

$$\therefore x + y = 3z$$

3. AC

Sol.  $\left(x + \frac{1}{x}\right)^2 = x^2 + \frac{1}{x^2} + 2 = \frac{17}{4} + 2 = \frac{25}{4}$

$$\Rightarrow x + \frac{1}{x} = \frac{5}{2}$$

$$\text{When } x + \frac{1}{x} = \frac{5}{2} \text{ then } x^3 + \frac{1}{x^3} = \left(x + \frac{1}{x}\right)^3 - 3\left(x + \frac{1}{x}\right) = \frac{65}{8}$$

4. C

Sol. Anything divided by zero is not defined. So, p can be zero but q cannot be equal to zero.

5. CD

Sol.  $(5a - 3b)^3 + (3b - 7c)^3 - (5a - 7c)^3$

$$\text{Let } 5a - 3b = x, 3b - 7c = y \text{ and } 7c - 5a = z$$

$$x^3 + y^3 + z^3 = 3xyz, \text{ if } x + y + z = 0$$

$$x + y + z = 5a - 3b + 3b - 7c - 5a = 0$$

$$(5a - 3b)^3 + (3b - 7c)^3 + (7c - 5a)^3$$

$$= 3(5a - 3b)(3b - 7c)(7c - 5a)$$

$\therefore$  It is divisible by  $5a - 3b, 3b - 7c, 7c - 5a$

6. ABD

Sol. Let  $\angle BAX = \angle DAX = x$

$$\Rightarrow \angle ABX = 180 - 2x \Rightarrow \angle BXA = x$$

$$\text{So, } AB = BX \Rightarrow AB = \frac{BC}{2}$$

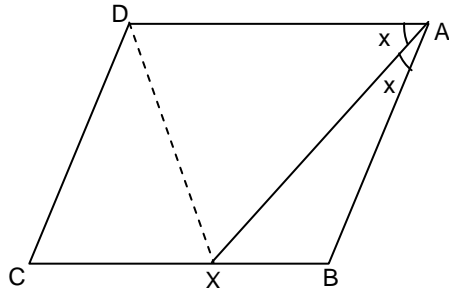
$$\text{or } AD = 2AB$$

$$\text{Now, } \angle C = 2x \text{ and } CX = CD$$

$$\Rightarrow \angle CDX = 90 - x \Rightarrow \angle ADX = 90 - x$$

$$\text{So, } \angle CDX = \angle ADX$$

$$\text{In } \triangle AXD, \angle AXD = 90^\circ$$



7. AD

Sol.  $a^m \times a^n = a^{mn}$

$$\Rightarrow m + n = mn$$



$$\Rightarrow \frac{1}{m} + \frac{1}{n} = 1$$

$$\begin{aligned} \text{Now } m(n-2) + n(m-2) \\ = 2mn - 2(m+n) = 0 \end{aligned}$$

8. B

Sol. Since  $x + 5$  is a factor

$$\Rightarrow (-5)^3 - 20(-5) + 5k = 0 \Rightarrow k = 5$$

9. D

$$\text{Sol. } 0.\overline{272} = \frac{272 - 2}{990}$$

$$= \frac{270}{990} = \frac{27}{99}$$

$$\text{and } 0.\overline{1363} = \frac{1363 - 13}{9900} = \frac{135}{990}$$

$$0.\overline{272} + 0.\overline{1363} = \frac{27}{99} + \frac{135}{990}$$

$$= \frac{405}{990} = \frac{9}{22}$$

10. C

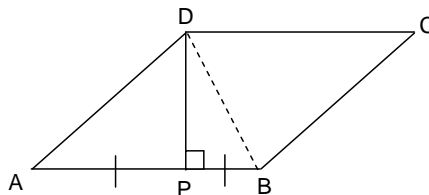
Sol. Join D to B

Now  $\triangle DAP \cong \triangle DBP$

$$\Rightarrow AD = DB$$

$\Rightarrow \triangle ABD$  is equilateral

$$\Rightarrow \angle A = 60^\circ \Rightarrow \angle D = 120^\circ$$



11. D

Sol.  $2^{1/2}, 3^{1/3}$  and  $5^{1/6}$

$$2^{3/6}, 3^{2/6}, 5^{1/6}$$

$$(2^3)^{1/6}, (3^2)^{1/6}, (5)^{1/6}$$

$$(8)^{1/6}, (9)^{1/6}, (5)^{1/6}$$

$$9^{1/6} > 8^{1/6} > 5^{1/6}$$

12. B

Sol.  $5^{2m-1} = 5^{2m-2} + 100$

$$\text{Let } 5^{2m} = t \Rightarrow \frac{t}{5} = \frac{t}{25} + 100$$

$$\frac{4t}{25} = 100$$

$$t = 25^2$$

$$5^{2m} = 5^4$$

$$m = 2$$

$$\text{So, } 3^{2+m} = 3^{2+2} = 81$$

13. A

Sol.  $10a + 5 = 42 + 6a - 5$

$$4a = 32$$

$$a = 8$$

14. D

Sol.  $-8a + 12 - 13 = -16 + 10 + a$   
 $\Rightarrow 9a = 5$   
 $\Rightarrow a = \frac{5}{9}$

15. C

Sol.  $B = 3^{3^{33}} = (3^3)^{3^{32}} = 27^{3^{32}}$   
 $D = 3^{3^{3^3}} = 3^{3^{27}} = (3^3)^{3^{26}} = 27^{3^{26}}$   
 $B \times D = 3^{3^{33} + 3^{27}} = 3^{3^{27} \times 730}$

16. B

Sol.  $A = 3^{3^{33}} = (3^3)^{111} = 27^{111}$   
 $B = 3^{3^{33}} = (3^3)^{3^{32}} = 27^{3^{32}}$   
 $C = 3^{3^{3^3}} = (3^3)^{11 \times 3^{3^2}} = 27^{11 \times 3^{3^2}}$   
 $D = 3^{3^{3^3}} = 3^{3^{27}} = (3^3)^{3^{26}} = 27^{3^{26}}$   
 So,  $B > D > C > A$

17. D

18. C

**Sol. (17 and 18)**

$$x^2 + x - 2 = (x + 2)(x - 1)$$

$$\therefore f(1) = 0 \Rightarrow p + q = -1$$

$$f(-2) = 0 \Rightarrow 2p - q = -8$$

$$\therefore p = -3, q = 2$$

$$\therefore f(x) = x^3 - 3x + 2$$

$$\Rightarrow f(-1) = 4$$

19. B

Sol.

(A).

$$x^{x^{3/2}} = (x^{3/2})^x \Rightarrow x^{3/2} = \frac{3}{2}x \Rightarrow x = \frac{9}{4}$$

(B).

$$a^6 + b^6 + 3a^2b^2(a^2 + b^2) = a^6 + b^6 + 2a^3b^3$$

$$\Rightarrow 3(a^2 + b^2) = 2ab$$

$$\Rightarrow \frac{a}{b} + \frac{b}{a} = \frac{2}{3}$$

(C).  $\left(a + \frac{1}{b}\right)\left(b + \frac{1}{c}\right)\left(c + \frac{1}{a}\right) = \frac{108}{11}$

$$\Rightarrow abc + \frac{1}{abc} + \left(a + \frac{1}{b}\right) + \left(b + \frac{1}{c}\right) + \left(c + \frac{1}{a}\right) = \frac{108}{11}$$

$$\Rightarrow abc + \frac{1}{abc} = \frac{108}{11} - \frac{86}{11} = 2$$

$$\Rightarrow abc = 1$$

(D).  $(5^{1/3} - 2^{1/3})(2^{2/3} + 5^{1/3} \cdot 2^{1/3} + 5^{2/3})$

$$= (5^{1/3})^3 - (2^{1/3})^3 = 3$$

20. D  
Sol.

A.  $\frac{x^8 + 1}{x^6 + 7x^4 + x^2} = \frac{x^4 + \frac{1}{x^4}}{x^2 + 7 + \frac{1}{x^2}}$

$$= \frac{x^4 + \frac{1}{x^4}}{x^2 + \frac{1}{x^2} + 7}$$

$$= \frac{[(\sqrt{5})^2 - 2]^2 - 2}{(\sqrt{5})^2 - 2 + 7}$$

$$= \frac{9 - 2}{3 + 7} = \frac{7}{10}$$

B.  $64^{2x-5} = 4 \times 8^{x-5}$

$$\frac{8^{4x-10}}{8^{x-5}} = 4$$

$$\Rightarrow 8^{3x-5} = 4$$

$$\Rightarrow 2^{9x-15} = 2^2$$

$$\Rightarrow 9x = 17 \Rightarrow x = \frac{17}{9}$$

C.  $\frac{7}{6} \left( 6a - \frac{1}{7a} \right) = \frac{7}{6} \times 18$

$$7a - \frac{1}{6a} = 21$$

$$49a^2 + \frac{1}{36a^2} = 441 + 2 \times 7 \times \frac{1}{6}$$

$$= 441 + \frac{7}{3}$$

$$= \frac{1323 + 7}{3}$$

$$= \frac{1330}{3}$$

D.  $x + \frac{1}{x} = 2 \Rightarrow (x-1)^2 = 0 \Rightarrow x = 1$

So,  $x^{10} + \frac{1}{x^{10}} = 2$

1. 4

Sol.  $x = \sqrt[3]{20 + 14\sqrt{2}} + \sqrt[3]{20 - 14\sqrt{2}}$   
 $x^3 = 20 + 14\sqrt{2} + 20 - 14\sqrt{2} + 6x$   
 $x^3 - 6x = 40$   
 $x^3 - 6x - 40 = 0$   
 Clearly,  $x = 4$

2. 3

Sol. Say  $f(x) = ax^2 + bx + c$   
 $f(x) = ax^2 + bx + c$   
 $f(2) = 4a + 2b + c = 10$   
 $f(-2) = 4a - 2b + c = -2$   
 $\Rightarrow 4b = 12$   
 $b = 3$

3. 4

Sol.  $x^3 - 3x^2 + 3x + 7 = (x+1)(ax^2 + bx + c)$   
 Since  $x^3 - 3x^2 + 3x + 7 = (x+1)(x^2 - 4x + 7)$   
 $\Rightarrow x^2 - 4x + 7 = ax^2 + bx + c \Rightarrow a = 1, b = -4, c = 7 \Rightarrow a + b + c = 4$

4. 7

Sol. Applying factor theorem  
 $f(-2) = f(-5) = 0$   
 $f(-5) = (-5+2)((-5)^2 + 6(-5) + a) = 0$   
 $a = 5$   
 $g(-2) = g(-5) = 0$   
 $g(-2) = (-2+5)((-2)^2 + 8(-2) + b) = 0$   
 $b = 12$

5. 9

Sol.  $a^2 + b^2 + c^2 + 6b + 8c - 2a = -26$   
 $a^2 - 2a + 1 + b^2 + 6b + 9 + c^2 + 8c + 16 = 0$   
 $(a-1)^2 + (b+3)^2 + (c+4)^2 = 0$   
 $a = 1, b = -3, c = -4$  since sum of three positive numbers can be 0, only when each terms must be 0  
 $2x - 1 + 3x - 3 - 4x - 4$   
 $2 - 9 + 16 = 9$

6. 1

Sol.  $2^{a/b} = 8 \Rightarrow \frac{a}{b} = 3$   
 $\frac{12ab}{a^2 + 27b^2} = \frac{36b^2}{36b^2} = 1$