

Aakash National Talent Hunt Exam 2020
SAMPLE PAPER
(Class XI Studying Moving to Class XII)

ANSWERS

Physics	Chemistry	Mathematics
1. (1)	12. (3)	23. (3)
2. (2)	13. (1)	24. (4)
3. (4)	14. (3)	25. (4)
4. (1)	15. (3)	26. (3)
5. (4)	16. (4)	27. (1)
6. (1, 3)	17. (1, 3, 4)	28. (2)
7. (1, 3)	18. (1, 2, 3, 4)	29. (3, 4)
8. (2)	19. (2)	30. (1, 2)
9. (1)	20. (4)	31. (1, 2)
10. (3)	21. (1)	32. (1)
11. A → (R)	22. A → (P, Q, R)	33. (2)
B → (P)	B → (P, Q, R)	34. (3)
C → (S)	C → (Q, S)	35. A → (Q)
D → (Q)	D → (P, Q, S)	B → (S)
		C → (P)
		D → (P)

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SAMPLE PAPER

ANSWERS & SOLUTIONS

PHYSICS

1. Answer (1)

$$E = F \times L = [\text{MLT}^{-2}][\text{L}] = [\text{ML}^2\text{T}^{-2}]$$

2. Answer (2)

$$d = 2 \times \frac{1}{2} \times g \times \left(\frac{1}{2}\right)^2 = 2.5 \text{ m}$$

3. Answer (4)

$$R = \frac{u^2 \sin 2\theta}{g} = \frac{(4\sqrt{2})^2}{10} = 3.2 \text{ m}$$

4. Answer (1)

$$a = \frac{F}{(4+2)} = \frac{12}{6} = 2 \text{ m/s}^2$$

$$T = 2a = 2 \times 2 = 4 \text{ N}$$

5. Answer (4)

$$\vec{F}_{\text{ext}} = m\vec{a}$$

$$\text{If } \vec{a} = 0 \Rightarrow \vec{F}_{\text{ext}} = 0$$

$$\Rightarrow \vec{F}_{\text{on } m} = mg\hat{j} \quad (\text{by wedge})$$

$$\text{Hence, } \vec{F}_{\text{on wedge}} = mg(-\hat{j})$$

6. Answer (1, 3)

Theory based

7. Answer (1, 3)

$$v^2 = (\sqrt{5g\ell})^2 - 2g(2\ell) = g\ell \quad \text{At topmost point}$$

$$\Rightarrow v = \sqrt{g\ell}, \quad T = \frac{mv^2}{\ell} + mg = 6mg$$

8. Answer (2)

9. Answer (1)

Solution for Q. Nos. 8 & 9 :

$$x_{\text{CM}} = \frac{(m)(0) + m(a) + m(0)}{3m} = \frac{a}{3}$$

$$\text{Similarly, } y_{\text{CM}} = \frac{a}{3}$$

10. Answer (3)

$$\vec{v} = 2(\hat{i} - \hat{j}), \quad \vec{a} = 4(\hat{i} - \hat{j})$$

Both \vec{v} and \vec{a} are parallel.

11. Answer A(R); B(P); C(S); D(Q)

$$\tau_A = I_A \alpha$$

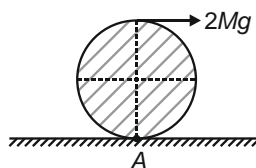
$$\Rightarrow (2Mg)(2R) = \left(\frac{MR^2}{2} + MR^2 \right) \alpha$$

$$\Rightarrow 4MgR = \left(\frac{3}{2} MR^2 \right) \alpha$$

$$\Rightarrow \alpha = \frac{8g}{3R} \Rightarrow \alpha = \frac{8 \times 10}{3 \times 1} = \frac{80}{3}$$

$$a = R\alpha = \frac{80}{3}, \quad a_P = a + R\alpha = \frac{160}{3}$$

$$\therefore a_Q = \frac{80\sqrt{2}}{3}$$



CHEMISTRY

12. Answer (3)

$$\text{Mass} = \frac{180}{6 \times 6.02 \times 10^{23}} \times 1.2 \times 10^{24} = 59.8 \text{ g}$$

13. Answer (1)

$$\sqrt{\frac{3R \times 341.33}{16}} = \sqrt{\frac{2RT}{2}}$$

14. Answer (3)

Enthalpy is extensive.

15. Answer (3)

$$O > F > N > B > C$$

16. Answer (4)

$$\Delta H_{s,P} < 0 \quad - \quad \text{Spontaneous}$$

Thermodynamic variable for ΔH should be entropy and pressure.

17. Answer (1, 3, 4)

Correct order of electronegativity halogen element is $I < Br < Cl < F$.

All other order are correct.

18. Answer (1, 2, 3, 4)

All are correct.

Solution for Q. Nos. 19 & 20 :

$$E_1 = kz^2 \left[1 - \frac{1}{9} \right] = \frac{8}{9} kz^2$$

$$E_3 = kz^2 \left(\frac{1}{9} - 0 \right) = \frac{kz^2}{9}$$

$$\Rightarrow E_1 = 8E_3$$

$$E_2 = \frac{k(2)^2}{4} = k = \text{ionisation of H-atom}$$

19. Answer (2)

20. Answer (4)

All H-atom will be ionized.

21. Answer (1)

In isothermal expansion, $q = \Delta U - W = -W > 0$

Since, $\Delta U = f(T) = 0$

22. Answer A(P, Q, R); B(P, Q, R); C(Q, S); D(P, Q, S)

N_2, O_2^{2+}	–	Bond order = 3
		Bonding electrons = 10
		Non-bonding electrons = 4
		Diamagnetic
B_2	–	Bond order = 1
		Bonding electrons = 6
		Non-bonding electrons = 4
		Paramagnetic
O_2	–	Bond order = 2
		Bonding electrons = 10
		Non-bonding electrons = 6
		Paramagnetic

MATHEMATICS

23. Answer (3)

$$((x+2)(x+12))((x+3)(x+8)) = 4x^2$$

$$(x^2 + 14x + 24)(x^2 + 11x + 24) = 4x^2$$

$$\left(x + 14 + \frac{24}{x} \right) \left(x + 11 + \frac{24}{x} \right) = 4$$

$$\text{Let } x + \frac{24}{x} = t$$

$$(t+14)(t+11) = 4$$

$$t = -15, -10$$

$$x + \frac{24}{x} = -15, -10$$

$$\therefore x = \frac{-15 \pm \sqrt{129}}{2}, -4, -6$$

24. Answer (4)

$$\frac{\sqrt{3}}{2} + \frac{1}{2} + \frac{1}{\sqrt{3}}$$

25. Answer (4)

$$x \in (-\infty, -5) \cup (-2, 3)$$

26. Answer (3)

$$\frac{(\sin 9^\circ \cos 9^\circ)(\sin 39^\circ \cos 39^\circ)(\sin 21^\circ \cos 21^\circ)}{\sin 54^\circ} = \frac{1}{8} \frac{(\sin 18^\circ)(\sin 78^\circ)(\sin 42^\circ)}{\sin 54^\circ} = \frac{1}{32}$$

27. Answer (1)

$$n(A \cup B) = 10 + 15 - 2 = 23$$

28. Answer (2)

$$\text{As } a_1 + a_3 + a_5 + \dots + a_{99} = 60$$

$$\Rightarrow a + 49d = \frac{6}{5}$$

$$\text{Also, } |-a_1 - a_3 + a_5 + a_7 \dots - a_{99}| = |-2(a + 49d)| = \frac{12}{5}$$

29. Answer (3, 4)

$$\sin x = \frac{4}{5}, \quad \cos x = \frac{3}{5}$$

$$\sin 2x = \frac{24}{25}, \quad \cos 2x = 2\left(\frac{9}{25}\right) - 1$$

30. Answer (1, 2)

$$(z-1)(z-i)(z+2i) = 0$$

$$z = 1, i, -2i$$

31. Answer (1, 2)

$$\frac{(xy+1)^2 - 2x(xy+1) + 2x^2}{x(xy+1)} = \frac{xy+1}{x} + \frac{2x}{xy+1} - 2 = 2\sqrt{2} - 2$$

32. Answer (1)

$$\frac{8!}{2!}$$

33. Answer (2)

MDTTN, EIIAO

$$\frac{6!}{2!} \times \frac{5!}{2!}$$

34. Answer (3)

$$S = 1 - 2 + 3 - 4 \dots n \text{ terms}$$

For $n = \text{even} = 2m$

$$S = (1 - 2) + (3 - 4) \dots$$

$$= -m = \frac{-n}{2}$$

$$n = \text{odd} = (2m + 1)$$

$$S = (1 - 2) + \dots + (2m + 1)$$

$$= -m + 2m + 1 = m + 1 = \frac{n+1}{2}$$

35. Answer A(Q); B(S); C(P); D(P)

$$(A) f(x) = |\sqrt{x-5}-1| - |\sqrt{x-5}+1| + \ln(8-x)$$

$$x - 5 \geq 0 \text{ and } 8 - x > 0$$

$$x = 5, 6, 7 \rightarrow 3 \text{ integers}$$

$$(B) |x| > e \text{ or } |x| < \frac{1}{e} \text{ and } |x| \in [2, 5]$$

$$\therefore |x| \in [e, 5]$$

$$\therefore x = -3, -4, -5, 3, 4, 5 \rightarrow 6 \text{ integers}$$

$$(C) x \neq \pm 1, 0, x > 0$$

$$|x| < 4$$

$$\therefore x = 2, 3 \rightarrow 2 \text{ integers}$$

$$(D) |x| < 2$$

Integers can be $-1, 0, 1$

For these 3 integers,

$$10 - x > 0$$

$$\therefore \sin x \geq 0$$

$$\therefore x = 0, 1 \rightarrow 2 \text{ integers}$$

