MENIIT

NEET • IIT-JEE

MTSE

MENIIT TALENT SEARCH EXAM

2024

MTSE SAMPLE PAPER

Standard - XII
(Moving to Standard - XII Pass)

Code : EE-SP

Corporate Office: 44-A/1, Kalu Sarai, Near Hauz Khas Metro Station New Delhi 110016 www.meniit.com 8448815580

MERIT & APTITUDE TEST
(CODE: EE)

Time: 90 Minutes **Maximum Marks: 220**

Instructions

(A) GENERAL

1. This booklet is your Question Paper. It contains **FOUR sections. Section-(A) has 12 questions of Physics, Section-(B) has 12 questions of Chemistry, Section-(C) has 16 questions of Mathematics and Section-(D) contains 15 questions from Mental Aptitude.**
2. This booklet contains **55 questions of four mark each in all**. All the questions are COMPULSORY.
3. Blank papers, clip boards, log tables, slide rule, calculators, cellular phones and electronic gadgets in any form, are not allowed.
4. Write your **Name and Roll No**. in the space provided at the bottom of this sheet.

(B) FILLING IN THE OMR SHEET

5. On the OMR sheet, **write in ink** your Name, Roll No., name of the centre and put your signature in the appropriate boxes.
6. Every question has **four choices** for its answer (A), (B), (C) & (D). Only **one** of them is the right answer.
7. On the OMR sheet, for each question number, darken **only one** bubble with pen only corresponding to what you consider to be the most appropriate answer.

(C) MARKING SCHEME

8. (i) You will be awarded **4 marks** if you have darkened the bubble corresponding to the right answer.
   (ii) In case you have darkened the wrong bubble, **1 mark will be deducted** for that response. **There is NEGATIVE MARKING for all incorrectly marked responses.**

Name of the Candidate	:
Roll Number	:
Date of Examination	: ***Centre:***

SECTION – (A) PHYSICS

1. An α particle is moving along a circle of radius R with a constant angular velocity ω. Point A lies in the same plane at a distance 2R from the centre. Point A records magnetic field produced by α particle. If the minimum time interval between two successive times at which A records zero magnetic field is 't', the angular speed ω, in terms of t is –

(a) $\frac{2\pi}{t}$ (b) $\frac{2\pi}{3t}$ (c) $\frac{\pi}{3t}$ (d) $\frac{\pi}{t}$

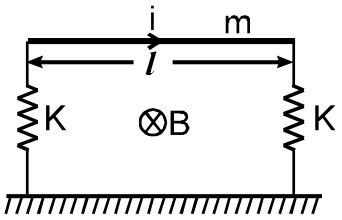
2. In region x > 0, a uniform and constant magnetic field $\vec{B}_1 = 2B_0\hat{k}$ exists. Another uniform and constant magnetic field $\vec{B}_2 = B_0\hat{k}$ exists in region x < 0. A positively charged particle of mass m and charge q is crossing origin at time t = 0 with a velocity $\vec{u} = u_0\hat{i}$. The particle comes back to its initial position after a time: (B_0, u_0 are positive constants)

(a) $\frac{3}{2}\frac{\pi m}{qB_0}$ (b) $\frac{2\pi m}{qB_0}$

(c) $\frac{3\pi m}{qB_0}$

(d) Particle doesn't come back to its initial position

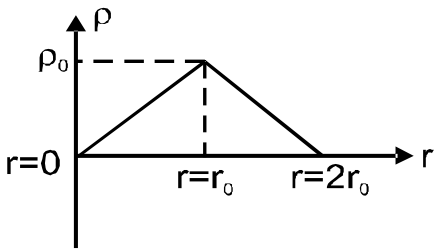
3. A horizontal metallic rod of mass ' m ' and length ' λ ' is supported by two vertical identical springs of spring constant ' K ' each and natural length λ_0. A current ' i ' is flowing in the rod in the direction shown. If the rod is in equilibrium, then the length of each spring in this state is:



(a) $\lambda_0 + \frac{i\ell B - mg}{K}$ (b) $\lambda_0 + \frac{i\ell B - mg}{2K}$

(c) $\lambda_0 + \frac{mg - i\ell B}{2K}$ (d) $\lambda_0 + \frac{mg - i\ell B}{K}$

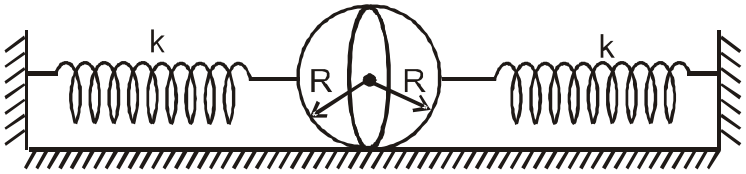
4. Charge density (ρ) in a solid sphere varies with radial distance from centre (r) as shown in the graph:



Electric field intensity at a point r = r_0 is:

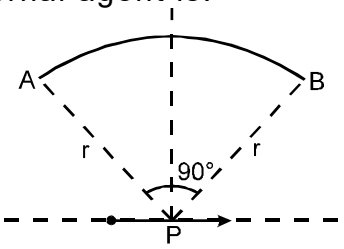
(a) $\frac{\rho_0 r_0}{\varepsilon_0}$ (b) $\frac{\rho_0 r_0}{2\varepsilon_0}$ (c) $\frac{2\rho_0 r_0}{\varepsilon_0}$ (d) $\frac{\rho_0 r_0}{4\varepsilon_0}$

5. Two non-conducting hemispherical surfaces, which are having uniform charge density σ are placed on smooth horizontal surface as shown in figure. Assuming springs are ideal, calculate compression in each spring if both the hemispherical surface is just touching each other.



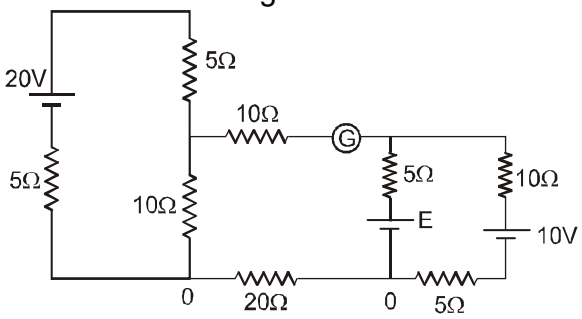
(a) $\frac{\sigma^2}{2\varepsilon_0}\frac{R^2}{K}$ (b) R (c) $\frac{\sigma^2}{2\varepsilon_0}\frac{\pi R^2}{K}$ (d) $\frac{\sigma^2 \pi R^2}{2\varepsilon_0 K}$

6. A charge ' q ' is carried from a point A (r, 135°) to point B (r, 45°) following a path which is a quadrant of circle of radius ' r '. If the dipole moment is $\vec{P}$, the work done by external agent is:



(a) zero (b) $\frac{qP}{4\pi\varepsilon_0 r^2}$ (c) $\frac{\sqrt{2}\,qP}{4\pi\varepsilon_0 r^2}$ (d) $\frac{qP}{4\pi\varepsilon_0 r}$

7. What should be value of E for which galvanometer shows no deflection:



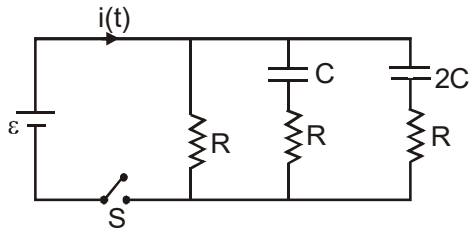
(a) 10 V (b) 5 V (c) 15 V (d) 20 V

8. In a meter bridge experiment the resistance of resistance box is 16Ω, which is inserted in right gap. The null point is obtained at 36 cm from the left end. The least count of meter scale is 1mm. The value of unknown resistance is –

(a) $9 \pm \frac{5}{128}\Omega$ (b) $9 \pm \frac{5}{256}\Omega$ (c) $9 \pm \frac{5}{512}\Omega$ (d) $9 \pm \frac{1}{2560}\Omega$

9. The two capacitors shown in the circuit are initially uncharged and the cell is ideal. The switch 'S' is closed at t = 0. Which of the following functions represents the current i(t), through the cell as a function of time?

(Take $I_0 = \frac{\varepsilon}{R}$)

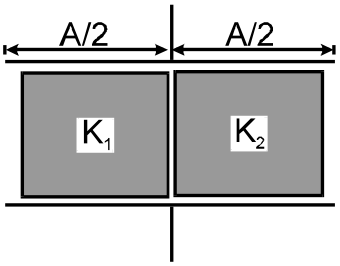


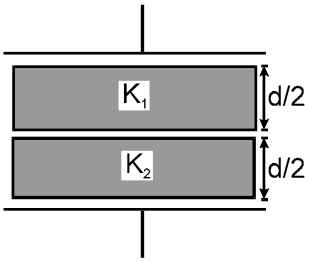
(a) $i(t) = i_0 + i_0 e^{-t/\tau}$, $\tau = RC$

(b) $i(t) = i_0 + i_0 e^{-t/\tau} + i_0 e^{-t/2\tau}$, $\tau = RC$

(c) $i(t) = i_0 + i_0 e^{-t/\tau}$, $\tau = \frac{3RC}{2}$ (d) $i(t) = i_0 + e^{-t/\tau}$, $\tau = 3RC$

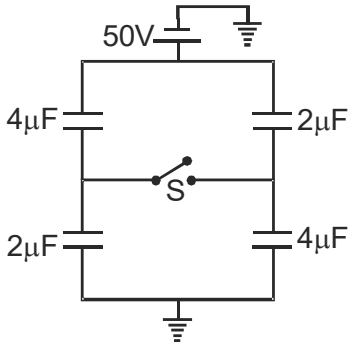
10. In the arrangement shown in figure, dielectric constant $K_1 = 2$ and $K_2 = 3$. If the capacitance is C_1 and C_2 respectively, then $\frac{C_1}{C_2}$ will be: (The gaps shown are negligible)





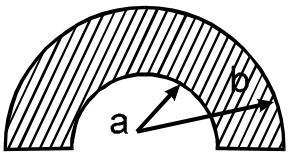
(a) 1: 1 (b) 2: 3 (c) 9: 5 (d) 25: 24

11. The circuit was in the shown state for a long time. Now if the switch S is closed then the net charge that flows through the switch S, will be



(a) $\frac{400}{3}\mu C$ (b) 100 μC (c) $\frac{100}{3}\mu C$ (d) 50 μC

12. A non – conducting semi-circular disc (as shown in figure) has a uniform surface charge density σ. The ratio of electric field to electric potential at the centre of the disc will be:



(a) $\frac{1}{\pi}\frac{\ell \ n \ b/a}{(b-a)}$ (b) $\frac{2}{\pi}$

(c) $\frac{1}{\pi}\frac{\ell \ n \ (b/a)^2}{(b-a)}$ (d) $\frac{\pi \ (b-a)}{2 \ \ell \ n(b/a)}$

SECTION – (B) CHEMISTRY

13. Van't Hoff factor for 0.1 M ideal solution is

(a) 0.1 (b) 1 (c) ∞ (d) zero

14. A 0.001 molal aqueous solution of a complex $[MA_8]$ has the freezing point of –0.0054°C. If the primary valency of the salt undergoes 100% ionization and k_f for water = 1.8 K $molal^{-1}$ the correct representation of complex is:

(a) $[MA_8]$ (b) $[MA_6]A_2$ (c) $[MA_4]A_4$ (d) $[MA_5]A_3$

15. Molar conductivity of a solution is related to the concentration (c) of a strong electrolyte by the relationship

(a) $\Lambda_m^\infty = \Lambda_m^c - b\sqrt{c}$ (b) $\Lambda_m^\infty = \Lambda_m^c + b\sqrt{c}$

(c) $\Lambda_m^c = \Lambda_m^\infty + bc^2$ (d) $\Lambda_m^\infty = \Lambda_m^c\sqrt{c} - b$

16. 108 g fairly concentrated solution of $AgNO_3$ is electrolyzed using 0.1 F of electricity. The weight of resulting solution is:

(a) 94 g (b) 96.4 g (c) 94.4 g (d) 100 g

17. The reduction potential at 25°C for Fe^{+3}/Fe^{+2} electrode if the concentration of Fe^{+2} ion is five times that of Fe^{+3} ions. (Given $E^o_{Fe^{+3}/Fe^{+2}} = 0.77V$)

(a) 0.73V (b) 0.62V (c) 1.05V (d) 0.52V

18. In Haber process of ammonia rate of disappearance of $H_2(g)$ is 15 mole L^{-1} min^{-1}, rate of reaction will be: (mole L^{-1} min^{-1})

(a) 15 (b) 10 (c) 5 (d) 45

19. Proceeding of a reaction A + B ⟶ P; is as

[A]	[B]	Rate
1.0	2.0	2×10^{-3} mole/l.s
0.1	2.0	10^{-3} mole/l.s
0.1	0.2	5×10^{-4} mole/l.s

Overall order of reaction will be

(a) 1.301 (b) 0.602 (c) 2 (d) 0

20. The half of a first order reaction is 60 min. How long will it take to consume 90% of the reaction

(a) 50 min (b) 100 min (c) 200 min (d) 250 min

21. There is no d-d transition in Cu^+ but Cu_2O is colored due to

(a) The presence of unpaired electron (b) The presence of colored O^{2-} ion

(c) Charge transfer from oxygen to metal (d) Charge transfer from metal to oxygen

22. Which of the following exhibits highest oxidation state?

(a) Cr (b) Mn (c) Fe (d) Co

23. Which of the following statements is incorrect?

(a) The order of splitting energy is: $PtCl_4^{2-} > PdCl_4^{2-} > NiCl_4^{2-}$

(b) $[Co(NH_3)_6]^{3+}$ is colorless whereas $[Ni(H_2O)_6]^{2+}$ is colored.

(c) $[M(en)(gly)]^{n+}$ will represent geometrical isomerism.

(d) The magnetic moment of $K_3[Fe(CN)_6]$ is $\sqrt{3}$ B.M.

24. The IUPAC name of complex $K_3[Al(C_2O_4)_3]$ is

(a) potassium aluminoxalate (b) potassium trioxalato aluminate (III)

(c) potassium aluminium (III) oxalate (d) potassium trioxalatoaluminate (VI)

SECTION – (C) MATHEMATICS

25. The equation of a curve passing through (2, 7/2) and having gradient $1-\frac{1}{x^2}$ at (x, y) is

(a) $y = x^2 + x + 1$ (b) $xy = x^2 + x + 1$

(c) $xy = x + 1$ (d) None of these

26. $\int \frac{\ln\left(\frac{x-1}{x+1}\right)}{x^2-1}dx$ is equal to:

(a) $\frac{1}{2}\left(\ln\left(\frac{x-1}{x+1}\right)\right)^2 + C$ (b) $\frac{1}{2}\left(\ln\left(\frac{x+1}{x-1}\right)\right)^2 + C$

(c) $\frac{1}{4}\left(\ln\left(\frac{x-1}{x+1}\right)\right)^2 + C$ (d) $\frac{1}{4}\left(\ln\left(\frac{x+1}{x-1}\right)\right)$

27. A root of the equation $\Delta = \begin{vmatrix} 0 & x-a & x-b \\ x+a & 0 & x-c \\ x+b & x+c & 0 \end{vmatrix} = 0$ is

(a) $\frac{1}{2}(a + b + c)$ (b) 0

(c) –1 (d) 1

28. If a, b, c are three complex numbers such that $a^2 + b^2 + c^2 = 0$ and

$\Delta = \begin{vmatrix} b^2+c^2 & ab & ac \\ ab & c^2+a^2 & bc \\ ac & bc & a^2+b^2 \end{vmatrix} = ka^2b^2c^2$, then the value of k is:

(a) 1 (b) 2 (c) –2 (d) 4

29. The inverse of a symmetric matrix (if it exists) is:
(a) a symmetric matrix (b) a skew-symmetric matrix
(c) a diagonal matrix (d) None of these

30. Two integers are chosen at random and multiplied. The probability that the product is an even integer is:
(a) 1/2 (b) 2/3 (c) 3/4 (d) 4/5

31. The mean and variance of a binomial distribution are 4 and 2, respectively. Then the probability of 2 successes is:
(a) 37/256 (b) 219/256
(c) 128/256 (d) 28/256

32. If $f(x) = \frac{x}{15}(3x^4 + 10x^2 + 15)$ and $g(x) = \cos^5 x$ where $x \in (0, 3)$ then –
(a) f(x) increases as g(x) decreases
(b) f(x) increases as g(x) increases
(c) f(x) decreases as g(x) decreases
(d) None of these

33. On the interval [0, 1] the function $x^{25}(1 – x)^{75}$ takes its maximum value at the point-
(a) 0 (b) 1/4 (c) 1/2 (d) 1/3

34. The largest distance of the point (a, 0) from the curve $2x^2 + y^2 – 2x = 0$, is given by:
(a) $\sqrt{(1-2a+a^2)}$ (b) $\sqrt{(1+2a+2a^2)}$
(c) $\sqrt{(1+2a-a^2)}$ (d) $\sqrt{(1-2a+2a^2)}$

35. If a line OP through the origin O makes angles α, 45° and 60° with x, y and z axis respectively then the direction cosines of OP are
(a) $1/\sqrt{2}$, 1/2, 1/2 (b) 1/2, 1/2, $1/\sqrt{2}$
(c) 1/2, $1/\sqrt{2}$, 1/2 (d) None of these

36. The volume of the tetrahedron included between the plane 3x + 4y – 5z – 60 = 0 and the coordinate planes is:
(a) 60 (b) 600 (c) 720 (d) None of these

37. If $\vec{a}$, $\vec{b}$ and $\vec{c}$ are unit coplanar vectors, then the scalar triple product $[2\vec{a}-\vec{b}, 2\vec{b}-\vec{c}, 2\vec{c}-\vec{a}]$ =
(a) 0 (b) 1 (c) $-\sqrt{3}$ (d) $\sqrt{3}$

38. For unit vectors $\vec{b}$ and $\vec{c}$ and any non-zero vector $\vec{a}$, the value of $\{\{(\vec{a}+\vec{b}) \times (\vec{a}+\vec{c})\} \times (\vec{b}\times\vec{c})\}.(\vec{b}+\vec{c})$ is
(a) $|\vec{a}|^2$ (b) $2|\vec{a}|^2$
(c) $3|\vec{a}|^2$ (d) None of these

39. If $\cos\alpha + 2\cos\beta + 3\cos\gamma = \sin\alpha + 2\sin\beta + 3\sin\gamma = 0$, then the value of $\sin3\alpha + 8\sin3\beta + 27\sin 3\gamma$ is:

(a) $\sin(\alpha + \beta + \gamma)$ (b) $3\sin(\alpha + \beta + \gamma)$

(c) $18\sin(\alpha + \beta + \gamma)$ (d) $\sin(\alpha + 2\beta + 3)$

40. If $|z_1| = |z_2| = |z_3| = 1$ and $z_1 + z_2 + z_3 = 0$, then area of the triangle whose vertices are z_1, z_2, z_3, is:

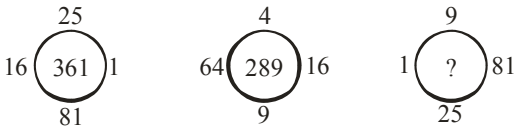
(a) $3\sqrt{3}/4$ (b) $\sqrt{3}/4$

(c) 1 (d) 2

SECTION – (D) APTITUDE

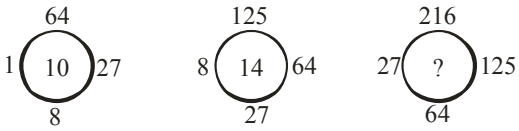
Direction *(Q. No. 41 – 42)*: *In each of the following circles, the first two circles show some operation on numbers around it and the result is given inside the circle. Based on these operations third circle is given find the inside number marked with (?).*

41.



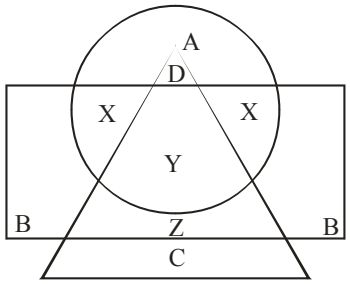
(a) 260 (b) 269 (c) 324 (d) 429

42.



(a) 2 (b) 9 (c) 17 (d) 18

Directions: *(Q. No. 43 – 46): In the following diagram, the circle represents College, Professors, the triangle stands for Surgical Specialists, and Medical Specialists are represented by the rectangle:*



43. College Professors who are also Surgical Specialists are represented by

(a) A (b) B (c) C (d) D

44. Surgical Specialists who are also Medical Specialists but not Professors are represented by

(a) B (b) C (c) X (d) Z

45. C represents

(a) Medical Specialists (b) College Professors

(c) Surgical Specialists (d) Medical and Surgical Specialists

46. B represents

(a) Professors who are neither Medical nor Surgical Specialists

(b) Professors who are not Surgical Specialists

(c) Medical Specialists who are neither Professors nor Surgical Specialists

(d) Professors who are not Medical Specialists

47. If C denotes +, D denotes ×, E denotes ÷ and F denotes –, then which of the following statement is true?

(a) 3 F 4 D 2 C 6E 3 = $1\frac{1}{3}$ (b) 3 C 16 E 4 F 2D 9 = –11

(c) 16 E 9 C 2 D 5 F 4 = $1\frac{1}{3}$ (d) 1 F 2 F 4 C 3 D 4 = 11

48. If 'Ring' is called 'Necklace', 'Necklace' is called a 'Chain' is called 'Earring' and 'Earring' is called 'Wrist-band', which of the following would be worn in the finger?

(a) Ring (b) Necklace

(c) Wrist-band (d) Earring

49. If 'Book' is called 'Watch', 'Watch' is called 'Bag', 'Bag' is called 'Dictionary' and 'Dictionary' is called 'Window', which is used to carry the books?

(a) Dictionary (b) Bag

(c) Book (d) Watch

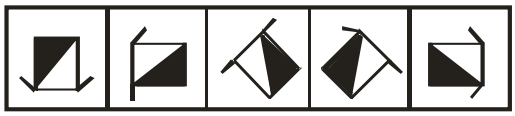
50. In a certain code language, 'sup na kol' means 'Fruit is good', 'Kol so hir' means 'Tree is tall' and Sup zp yop' means 'Eat good food', which of the following means fruit in that language?

(a) Sup (b) Na

(c) Kol (d) None of these

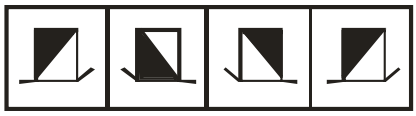
Directions: ***(Q. No. 51 – 53)*: *Each of the following questions consists of five figures marked A, B, C, D and E called the Problem Figures followed by five other figures marked 1, 2, 3 and 4 called the Answer Figures. Select a figure from amongst the Answer Figures which will continue the same series as established by the five Problem Figure.***

51. **PROBLEM FIGURES**



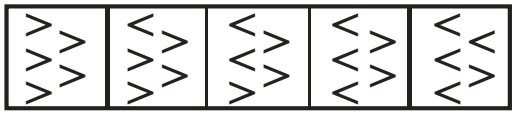
(1) (2) (3) (4) (5)

ANSWER FIGURES



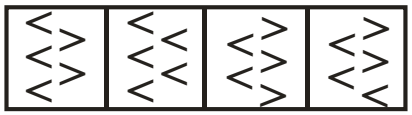
(A) (B) (C) (D)

52. **PROBLEM FIGURES**



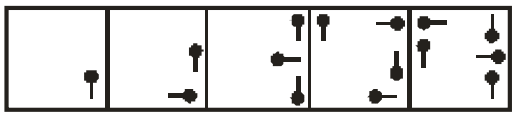
(1) (2) (3) (4) (5)

ANSWER FIGURES



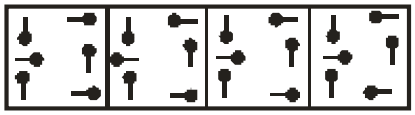
(A) (B) (C) (D)

53. **PROBLEM FIGURES**



(1) (2) (3) (4) (5)

ANSWER FIGURES



(A) (B) (C) (D)

54. If GONE is written as ILPB, CRIB may then be written as

(a) EYKO (b) EUKY

(c) EKUY (d) EOKY

55. If LPPHGLDWH is written as IMMEDIATE, then, WRSVHFUHW may be written as

(a) TOP SECRET (b) SACRIFICE

(c) ROUND FIRE (d) TABLE HOOK

★★★★★

ANSWER KEY | SAMPLE PAPER (ENGG)

Standard XII (Moving to Standard XII Pass) • (Code : EE-SP)

1.	(b)	20.	(c)	39.	(c)
2.	(b)	21.	(c)	40.	(a)
3.	(b)	22.	(b)	41.	(c)
4.	(d)	23.	(c)	42.	(d)
5.	(c)	24.	(b)	43.	(d)
6.	(c)	25.	(b)	44.	(d)
7.	(a)	26.	(c)	45.	(c)
8.	(a)	27.	(b)	46.	(c)
9.	(b)	28.	(d)	47.	(b)
10.	(d)	29.	(a)	48.	(b)
11.	(d)	30.	(b)	49.	(a)
12.	(c)	31.	(d)	50.	(b)
13.	(b)	32.	(a)	51.	(c)
14.	(b)	33.	(b)	52.	(b)
15.	(b)	34.	(d)	53.	(c)
16.	(b)	35.	(a)	54.	(d)
17.	(a)	36.	(b)	55.	(a)
18.	(c)	37.	(b)		
19.	(b)	38.	(d)		