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EDUHEAL FOUNDATION

CLASS 11

LEVEL – 1

Set A1

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IEO

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BSE international finance olympiad (BIFO)

NATIONAL IIT-PMT OLYMPIAD (NIPO)

Instructions for the Candidate

1. You are allowed additional 10 minutes to fill the required details in the RESPONSE SHEET (OMR).
2. The question paper is made as per syllabus guidelines & pattern given in the information Booklet. The Question Paper for Classes 1 to 6 contains 40 Questions each to be answered in 60 minutes. The Question paper for classes 7 to 11 contains 60 Questions each to be answered in 60 minutes. All questions are compulsory. Further instructions are given in the instruction letter to the teacher.
3. Use the response sheet to mark your responses by darkening the required circle. The response sheet has to be returned to the foundation, duly filled in. THE STUDENT CAN RETAIN THE QUESTION PAPER.

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ROUGH WORK

GENERAL IQ

1. A is the son of B. C, B's sister has a son D and a daughter E. F is the maternal uncle of D.

How is A related to D?

(1) Cousin (2) Nephew

(3) Uncle (4) Brother

2. A clock is so placed that at 12 noon its minute hand points towards north-east. In which direction does its hour hand point at 1.30 p.m.?

(1) North (2) South

(3) East (4) West

3. Find the odd one out:

(1) 488 (2) 929

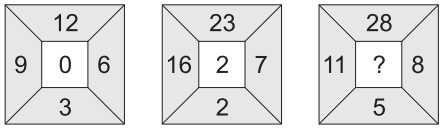
(3) 776 (4) 667

4. Two buses start from the opposite points of a main road, 150 km apart. The first bus runs for 25 km and takes a right turn and then runs for 15 km. It, then turns left and runs for another 25 km and takes the direction back to reach the main road. In the meantime, due to the minor breakdown the other bus has run only 35 km along the main road. What would be the distance between the two buses at this point?

(1) 65 km (2) 80 km

(3) 75 km (4) 85 km

5. Insert the missing character.



(1) 15 (2) 14

(3) 20 (4) 12

6. The wrong term in the following number series is:

89, 78, 86, 80, 85, 82, 83

(1) 83 (2) 82

(3) 86 (4) 78

Directions (Q.7 to Q.9): Words in capital letters in column-I are written in small letters in a code language in column-II. Decode the Language and find out the correct alternative for the given word in each question.

Column-I	Column-II
HERO	tbfw
JOIN	bakp
LAZY	nsvg
MINE	pdkt
PART	rwsx
SAURY	wveos
BLUE	eglt
CIGAR	vsqwp
WRIT	wpxy
VIRUS	pzwoe
QUACK	jqems
PIRL	wprg

7. Code for letters in the word TOIL are:

(1) pxba (2) bpgn

(3) bpxg (4) mpxg

8. Code for letters in the word COST are:

(1) boqx (2) xqps

(3) qost (4) xqnr

9. Code for letters in the word ULCER are:

(1) ggwmr (2) teqwp

(3) ktegp (4) gteqw

10. A, B and C are playing a game. When they start, they have 46 points between the 3 of them. They play 3 games. A wins the first, C the second and B the third game. When A wins, he gets 3 points from B and 3 points from C. When B wins, his points double and he gets some of these points from A and some from C. When C wins, he gets 2 points from A and 4 points from B. After the 3 games, all three of them have the same points with each of them that they had started with.

When B wins, how many points does he get from C?

(1) 5

(2) 3

(3) either 3 or 4

(4) 4

SECTION B: PHYSICS & CHEMISTRY

11. A unit vector perpendicular to $\vec{i}-2\hat{j}+\hat{k}$ and $3\vec{i}+\hat{j}-2\hat{k}$ is

(1) $\frac{5\vec{i}+3\hat{j}+7\hat{k}}{\sqrt{83}}$ (2) $\frac{3\vec{i}+5\hat{j}+7\hat{k}}{\sqrt{83}}$

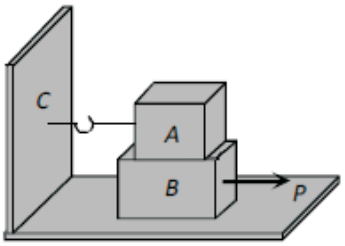
(3) $\frac{5\vec{i}+3\hat{j}-7\hat{k}}{\sqrt{83}}$ (4) $\frac{3\vec{i}-5\hat{j}+7\hat{k}}{\sqrt{83}}$

12. Car B is ahead of car A by 100 m. Car A is moving with constant speed 10 m/s and car B starts from rest accelerating with an acceleration 2 m/s^2. Find minimum distance between both the cars.

(1) 100 m (2) 50 m

(3) 75 m (4) 0 m

13. Block A weighing 100 kg rests on a block B and is tied with a horizontal string to the wall at C. Block B weighs 200 kg. The coefficient of friction between A and B is 0.25 and between B and the surface is 1/3. The minimum horizontal force P necessary to move the block B should be (g = 10 m/s^2)



(1) 1150 N (2) 1250 N

(3) 1300 N (4) 1420 N

14. A boy of mass 'm' is standing on a block of mass 'M' kept on a rough horizontal surface. When boy walks from left to right on the block, the centre of mass of the system (boy + block):

(1) remains stationary.

(2) shifts towards left.

(3) shifts towards right.

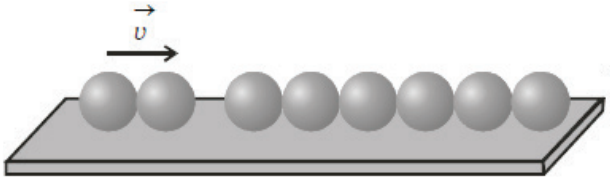
(4) shifts upwards.

15. A body of mass 1 kg thrown upwards with a velocity of 10 m/s comes to rest (momentarily) after moving up by 4m. The work done by air drag in this process is (Take g = 10 m/s^2)

(1) –20 J (2) –10 J

(3) –30 J (4) 0 J

16. Six identical balls are lined in a straight groove made on a horizontal frictionless surface as shown. Two similar balls each moving with a velocity v collide elastically simultaneously with the row of 6 balls from left. What will happen?



(1) One ball from the right rolls out with a speed $2v$ and the remaining balls will remain at rest.

(2) Two balls from the right roll out with speed v each and the remaining balls will remain stationary.

(3) All the six balls in the row will roll out with speed $v/6$ each and the two colliding balls will come to rest.

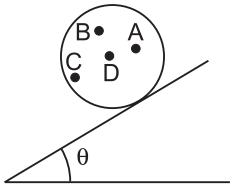
(4) The colliding balls will come to rest and no ball rolls out from right.

17. The total energy of the satellite in an orbit of radius r is:

(1) $\frac{GMm}{2r}$ (2) $\frac{GMm}{r}$

(3) $-\frac{GMm}{r}$ (4) $-\frac{GMm}{2r}$

18. A non-uniform sphere can be kept on a rough inclined plane so that it is in equilibrium. In the figure below, dots represents location of center of mass. In which one of the positions can sphere be in equilibrium?



(1) A (2) B

(3) C (4) D

19. A Carnot engine discharges 3 J of heat into the low temperature reservoir for every 2 J of work output. What is the efficiency of this Carnot engine?

(1) 1/3 (2) 2/5

(3) 3/5 (4) 2/3

20. In the aqueous solution of H_2SO_4 its mole fraction is 0.2 then closest value of molality of solution is

(1) 13.9 (2) 9.8

(3) 10.2 (4) 11.2

21. If angular momentum of an electron in an orbit is J according to Bohr model then J is directly proportional to

(1) r

(2) $\sqrt{r}$

(3) $1/r$

(4) $1/\sqrt{r}$

22. First, second and third ionisation energy values are 100 eV, 150 eV and 1500 eV. Element can be:

(1) Be

(2) B

(3) F

(4) Na

23. Consider the equation $Z = \frac{pV_m}{RT}$. Which of the following statements is correct?

(1) When Z > 1, real gases are easier to compress than the ideal gas at similar condition.

(2) When Z = 1, real gases get compressed easily than the ideal gas at similar condition.

(3) When Z > 1, real gases are difficult to compress than the ideal gas at similar condition.

(4) When Z = 1, real gases are difficult to compress than the ideal gas at similar condition.

24. Which of the following not have a three dimensional network structure?

(1) SiO_2

(2) Diamond

(3) P_4 (Black)

(4) CCl_4

25. What will be the de-broglie wavelength of particle (in Å) when it is accelerated by the voltage of 75 volts? (charge on particle = $4e^-$, $m_{particle} = \frac{1}{2} m_{electron}$)

(1) $\sqrt{2}$ (2) 2

(3) 1 (4) $\frac{1}{\sqrt{2}}$

26. For which set of elements "diagonal relationship" is not existing?

(1) B, Si (2) Li, Mg

(3) B, Mg (4) Be, Al

27. Cr (Z = 24), Mn^+ (Z = 25), Fe^{2+} (Z = 26) and Co^{3+} (Z = 27) are isoelectronic each having 24 electrons. Thus,

(1) all have configurations as [Ar] $4s^1$ $3d^5$

(2) Cr and Mn^+ have configurations as [Ar] $4s^1$ $3d^5$ while Fe^{2+} and Co^{3+} have configurations as [Ar] $3d^5$

(3) all have configurations as [Ar] $3d^6$

(4) all have configurations as [Ar] $4s^2$ $3d^6$

28. The synthesis of 3-octyne is achieved by adding a bromoalkane into a mixture of sodium amide and an alkyne. The bromoalkane and alkyne respectively are

(1) $BrCH_2CH_2CH_2CH_2CH_3$ and $CH_3CH_2C \equiv CH$

(2) $BrCH_2CH_2CH_3$ and $CH_3CH_2CH_2C \equiv CH$

(3) $BrCH_2CH_2CH_2CH_2CH_3$ and $CH_3C \equiv CH$

(4) $BrCH_2CH_2CH_2CH_3$ and $CH_3CH_2C \equiv CH$

29. The overlapping of orbitals in benzene is of the type

(1) sp – sp (2) $sp^2 - sp^2$

(3) $sp^3 - sp^3$ (4) Both (1) and (3)

30. In the following sequence of reactions, the alkene affords the compound 'B'

$CH_3CH = CHCH_3 \xrightarrow{O_3} A - \xrightarrow[Zn]{H_2O} B$

The compound B is

(1) CH_3CH_2CHO

(2) CH_3COCH_3

(3) $CH_3CH_2COCH_3$

(4) CH_3CHO

SECTION C: MATHEMATICS

31. If a, b, c are in GP and the equations $ax^2 + 2bx + c = 0$ and $dx^2 + 2ex + f = 0$ have a common root, then $\frac{d}{a}, \frac{e}{b}, \frac{f}{c}$ are in

(1) H.P.

(2) A.P.

(3) G.P.

(4) A.G.P.

32. The sum of the intercepts cut off by the coordinate axes on the lines $x + y = a, x + y = ar, x + y = ar^2$, ... ∞ where $a \neq 0$ and $r = \frac{1}{2}$ is

(1) $2\sqrt{2}a$ (2) $a\sqrt{2}$

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

33. The number of solutions of $z^{11} + \bar{z} = 0$ is (where z is a complex number)

(1) 13 (2) 6

(3) 11 (4) 1

34. If $|(x^2 + 5x + 9)| < |x^2 + 2x + 2| + |3x + 7|$ then :

(1) $x < -\frac{7}{3}$

(2) $x > -\frac{7}{3}$

(3) $x \leq -\frac{7}{3}$

(4) $x \geq -\frac{7}{3}$

35. If $3a + 2b + 6c = 0$ $(a, b, c \in R_0)$, the family of straight lines $ax + by + c = 0$ passes through a fixed point whose coordinates are given by

(1) (1/2, 1/3) (2) (2, 3)

(3) (3, 2) (4) (1/3, 1/2)

36. Let the quadratic equation is $x^2 + 2(a + 1)x + 9a - 5 = 0$. If $a > 7$, then:

(1) both roots are negative.

(2) roots are of opposite sign.

(3) roots are imaginary.

(4) atleast one root is negative.

37. Let there be a triangle ABC such that

$3 \sin A + 4 \cos B = 6$

$4 \sin B + 3 \cos A = 1$

The value of $\angle C$ in degrees is

(1) 120°

(2) 60°

(3) 30°

(4) 150°

38. If $\sin \alpha = A \sin(\alpha + \beta)$, $A \neq 0$, then the value of $\tan \beta$ is :

(1) $\frac{\sin\alpha(1 + A\cos\beta)}{A\cos\alpha\cos\beta}$

(2) $\frac{\sin\alpha(1 - A\cos\beta)}{A\cos\alpha\cos\beta}$

(3) $\frac{\cos\alpha(1 - A\sin\beta)}{A\cos\alpha\cos\beta}$

(4) $\frac{\cos\alpha(1 + A\sin\beta)}{A\cos\alpha\cos\beta}$

39. Evaluate $\lim_{x\to 0} \frac{e^x - e^{\sin x}}{x - \sin x}$

(1) 1/2 (2) 1

(3) 1/3 (4) 2

40. Out of 100 students, two sections of 40 and 60 are formed. If you and your friend are among the 100 students, what is the probability that you both enter the same sections?

(1) $\frac{18}{35}$

(2) $\frac{16}{33}$

(3) $\frac{17}{33}$

(4) $\frac{17}{35}$

SECTION C: BIOLOGY

31. In which of the following group of organisms excretory system, sensory system and nervous system are ill developed and two types of symmetry are found during their course of life?

(1) Mollusca
(2) Echinodermata
(3) Hemichordata
(4) Chordata

32. Which of the following group of plant produce seeds but not fruits?

(1) Gymnosperms
(2) Angiosperms
(3) Both (1) & (2)
(4) Pteridophytes

33. Which step of cellular respiration does not require oxygen?

(1) Glycolysis
(2) Kreb's cycle
(3) ETS
(4) All of the above

34. In aerobic respiration, maximum energy is released because:

(1) There is complete oxidation of glucose molecule.
(2) There is incomplete oxidation of glucose molecule.
(3) There is partial oxidation of glucose molecule.
(4) All of these

35. As chloride ions are inorganic activators for enzyme ptyalin, which among the given ions is working like the same for carboxypeptidase?

(1) Zinc
(2) Copper
(3) Manganese
(4) Magnesium

36. In transpiration

(1) Pure water is lost.
(2) Water in the form of dilute solution is lost.
(3) Only minerals are lost.
(4) Only water soluble organic materials are lost.

37. Match the following:

Column I (Plant species)	**Column II (Characteristics)**
(A) Mustard	(i) Replum
(B) Indigofera	(ii) Vexillary aestivation
(C) Ashwagandha	(iii) Swollen placenta
(D) Tulip	(iv) Epiphyllous condition

(1) A-(iv), B-(iii), C-(ii), D-(i)
(2) A-(i), B-(iii), C-(iv), D-(ii)
(3) A-(i), B-(ii), C-(iii), D-(iv)
(4) A-(iv), B-(iii), C-(i), D-(ii)

38. Study the given statements and select the correct options.

(A) Cellulose shows secondary helical structure.
(B) Turn over number of enzyme depends upon number of active sites.
(C) Every coenzyme is a cofactor but every cofactor is not coenzyme.

(1) (A), (B), (C)
(2) (B), (C)
(3) (A), (B)
(4) (A), (C)

39. The main pollutant of leather tanneries in the waste water is due to the salt of:

(1) Chromium (III)
(2) Chromium (VI)
(3) Copper
(4) Lead

40. Select wrong statement regarding viruses:

(1) All are obligate intracellular parasites.
(2) Nucleic acid is infectious.
(3) DNA and RNA both present in a virus.
(4) Protective capsid is proteinaceous.

INTERACTIVE SECTION

41. What is the effect of replacing ++ch with ch+1?

(1) 40 40 41

(2) 40 41 41

(3) 40 40 40

(4) 40 41 40

42. Select the incorrect statement regarding biomolecules:

(1) Lipids are not strictly macromolecules.

(2) Dietary protein are the source of essential amino acids.

(3) Lecithin is a phosphorylated glyceride found in cell membranes.

(4) Starch does not contain helices and thus gives blue colour with I_2.

43. A compound of vanadium has a magnetic moment of 1.73 BM. Electronic configuration of the vanadium ion in the compound is

(1) [Ar] $4s^0\ 3d^1$

(2) [Ar] $4s^2\ 3d^3$

(3) [Ar] $4s^1\ 3d^0$

(4) [Ar] $4s^0\ 3d^5$

44. PCl_5 exists but NCl_5 does not because

(1) nitrogen has no vacant 2*d*-orbitals.

(2) NCl_5 is unstable.

(3) nitrogen atom is much smaller than P.

(4) nitrogen is highly inert.

45. A vessel contains 0.5 mol each of SO_2, H_2 and CH_4. Its aperture was made open and then closed after sometime. Thus, order of partial pressure of the remaining gases in the vessel will be

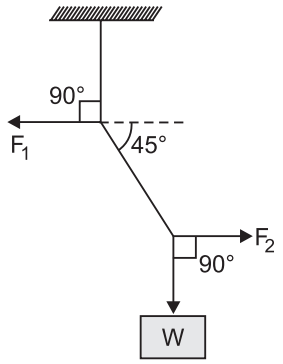
(1) $p_{SO_2} > p_{CH_4} > p_{H_2}$

(2) $p_{H_2} > p_{CH_4} > p_{SO_2}$

(3) $p_{H_2} > p_{SO_2} > p_{CH_4}$

(4) $p_{H_2} = p_{SO_2} = p_{CH_4}$

46. As shown in fig., the weight W is 60 N and it is in equilibrium. Then answer the following questions:



The tension in the diagonal string is approximately:

(1) 60 N

(2) 90 N

(3) 85 N

(4) 100 N

47. An open water wagon of mass 5×10^3 kg starts with initial velocity 1.2 m/s without friction on a railway track. Rain drops fall vertically downwards into the wagon. The velocity of the wagon after it has collected 10^3 kg of water will be

(1) 0.5 m/s

(2) 2 m/s

(3) 1 m/s

(4) 1.5 m/s

48. A chain of mass M = '9 kg' and length L = '10m' initially rests on a horizontal frictionless surface, if it is slightly pushed down the horizontal surface due to which the chain starts sliding down, then calculate closest value of the rate at which work is done on the chain by the gravitational force at the instant one third of the chain is hanging vertical. (Neglect all dissipative forces)

(1) 173 W

(2) 150 W

(3) 300 W

(4) 100 W

49. Consider the ground state of Cr (Z = 24). The numbers of electrons with the azimuthal quantum numbers $l = 1$ and 2 respectively are:

(1) 16 and 4

(2) 12 and 5

(3) 12 and 4

(4) 16 and 5

50. False fruit is

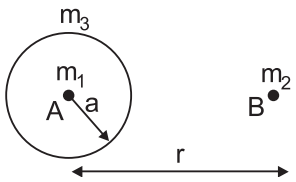
(1) Apple

(2) Pear

(3) Both (1) & (2)

(4) Mango

51. Two point masses of mass m_1 and m_2 are placed at point A and B respectively as shown in figure. Point A is the centre of hollow sphere of uniformly distributed total mass m_3. Consider only gravitational interaction between all masses and neglect other gravitational forces. Select the incorrect alternative.



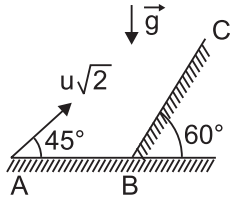
(1) Hollow sphere and point mass m_1 moves with same acceleration.

(2) m_1 and m_2 moves with same acceleration.

(3) Net force on m_1 is non-zero

(4) Net force on hollow sphere and point mass m_1 as a system is equal to force experienced by point mass m_2 in magnitude.

52. A particle is projected from point 'A' with velocity $u\sqrt{2}$ at an angle of 45º with the horizontal as shown in the figure. It strikes the inclined plane BC at right angle. The velocity of the particle just before the collision with the inclined is



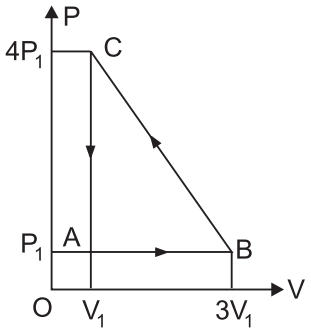
(1) $\frac{\sqrt{3}u}{2}$

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

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

(4) u

53. An ideal gas is taken via path ABCA as shown in Figure. The network done in the whole cycle is



(1) $3P_1V_1$

(2) $-3P_1V_1$

(3) $6\,P_1V_1$

(4) zero

54. Which of the following oxidation number is not shown by xenon (Xe)?

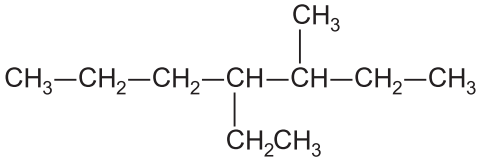
(1) +5

(2) +4

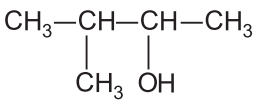
(3) +6

(4) 0

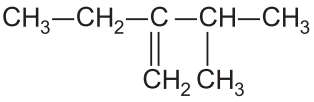
55. Name of some compounds are given. Which one is not as per IUPAC system?

(1) 

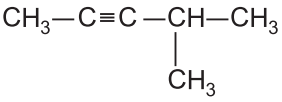
3–Methyl–4–ethyl heptane

(2) 

3–Methyl–2–butanol

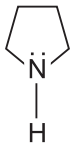
(3) 

2–Ethyl–3–methyl–but–1–ene

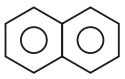
(4) 

4–Methyl–2–pentyne

56. Which of the following is aromatic compound?

(1) 

(2) 

(3) 

(4) All of these

57. A hydrogen like atom has ground state binding energy 122.4 eV. Then:

(1) its atomic number is 3.

(2) a photon of 90 eV can excite it to a higher state.

(3) a 80 eV photon can excite it to a higher state.

(4) both (1) and (3)

58. Plants absorb dissolved nitrates from soil and convert them into

(1) free nitrogen

(2) urea

(3) ammonia

(4) proteins

59. In C++ if return statements is written in a non-void function without any specified value, what will be return value of the function?

(1) undefined

(2) 1

(3) 0

(4) –1

60. In the following statements:

class sports {};

class test : public student{};

class result : public test, public sports {};

Here result class have implemented,

(1) Hierarchical inheritance

(2) Multiple inheritance

(3) Multilevel inheritance

(4) Both (2) and (3)

END OF THE EXAM