SCIENCE OLYMPIAD FOUNDATION
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DPS Science & Mathematics TALENT EXAMINATION 2015-2016

Time : 2 hrs. Total Marks : 100

Guidelines for the Candidate

1. The paper consists of two sections –

   Science (60 Questions) : Physics (20 Questions), Chemistry (20 Questions) & Biology (20 Questions) and

   Mathematics (40 Questions)
2. All questions are compulsory and carry equal marks. There is no negative marking. Use of calculator is not permitted.
3. Write your Name, School Name and Roll No. clearly on the OMR sheet and do not forget to sign.
4. There is only one correct answer hence mark one choice only.
5. Darken your choice with **HB Pencil** or **Blue / Black Ball Point Pen** only.

   For example :

   Q.16 : In the water cycle, condensation is the process of

   (A) Water vapour cooling down and turning into a liquid

   (B) Ice warming up and turning into a liquid

   (C) Liquid cooling down and turning into ice

   (D) Liquid warming up and turning into water vapour

As the correct answer is option (A), the candidate should darken the circle corresponding to option (A).

16. ● Ⓑ Ⓒ Ⓓ

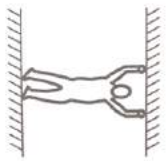
6. Rough work should be done in the blank space provided in the booklet.

PHYSICS

1. Two cars are moving in the same direction with the same speed of 45 km h^{-1}. They are separated by a distance of 7 km. What should be the speed of a car moving in opposite direction if it is to meet the two cars at an interval of 4 minutes?

(A) 30 km h^{-1} **(B)** 45 km h^{-1} **(C)** 60 km h^{-1} **(D)** 105 km h^{-1}

2. A man tries to remain in equilibrium by pushing with his hands and feet against two parallel walls as shown. Which of the following is not correct in order to remain in equilibrium?



(A) He must exert equal forces on the two walls.

(B) Friction must be present on both walls.

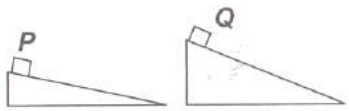
(C) The forces of friction at the two walls can be unequal.

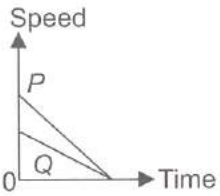
(D) None of these.

3. The line of action of the resultant of two parallel forces shifts by one-fourth of the distance between the forces when the two forces are interchanged. The ratio of the two forces is

(A) 1 : 2 **(B)** 2 : 3 **(C)** 3 : 4 **(D)** 3 : 5

4. Two identical blocks *P* and *Q* are placed on top of the smooth inclined planes as shown here. The blocks slide down the inclined planes from rest. Which graph best represents the variation of the speeds of *P* and *Q* with time?



(A)


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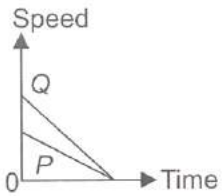

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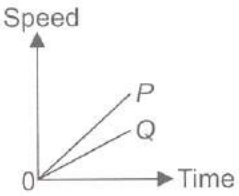

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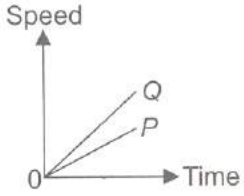


5. A boy stands at a distance of *x* m from a cliff and shouts loudly. The echo is heard 4 s later. The boy then walks a distance of 80 m away from the cliff and shouts again. This time the echo is heard 4.5 s later. The speed of sound in air is

(A) 310 m s^{-1} **(B)** 320 m s^{-1} **(C)** 330 m s^{-1} **(D)** Data insufficient

6. A hollow ice cube floats in a glass of water. As the ice melts, the level of water in the glass

(A) Increases **(B)** Decreases

(C) Remains same **(D)** First increases, then decreases

7. Which of the following statements are incorrect?

(i) A freely falling body does not attract the earth.

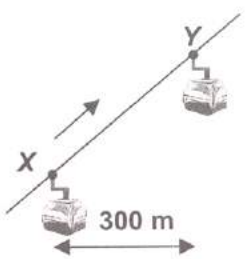
(ii) The value of gravitational constant on the moon is about one-sixth that of on the earth.

(iii) In a gravity-free space, the weight of a body becomes zero.

(iv) Acceleration due to gravity acting on a freely falling body depends on its mass.

(A) (i) and (iii) **(B)** (ii) and (iv) **(C)** (i), (ii) and (iv) **(D)** (ii), (iii) and (iv)

8. The given diagram shows the motion of a cable car. Initially, the cable car is at point *X* and at rest. It accelerates at 1.5 m s^{-2} for a time of 2 s. Then it moves at constant speed for 100 s and finally decelerates to rest in 3 s to reach point *Y*. The change in vertical height of the cable car is



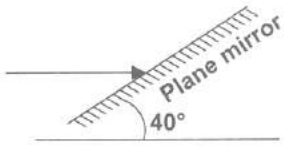
(A) 60 m **(B)** 67.5 m

(C) 300 m **(D)** 307.5 m

9. Two bodies are in equilibrium when suspended in a liquid from the arms of a balance. The mass of one body is 96 g and its density is 24 g cm^{-3}. The mass of the other body is 124 g and its density is 15.5 g cm^{-3}. Then the density of liquid is

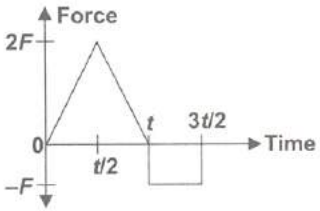
(A) 1 g cm^{-3} (B) 7 g cm^{-3} (C) 8.5 g cm^{-3} (D) 39.5 g cm^{-3}

10. A plane mirror is inclined at 40° to the floor. An incident ray parallel to the floor strikes the mirror and a reflected ray is formed. If the angle of inclination is increased to 55° without changing the direction of the ray, what is the change in angle between the incident ray and the reflected ray?



(A) 5° (B) 10° (C) 15° (D) 30°

11. A body of mass m, initially at rest, is acted upon by only one force as indicated in figure. Then the total work done by the force is



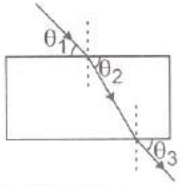
(A) $\frac{F^2t^2}{2m}$ (B) $\frac{3F^2t^2}{8m}$

(C) $\frac{F^2t^2}{8m}$ (D) $\frac{9F^2t^2}{8m}$

12. The wavelength of the vibrations produced by a body is 22 m in air. When this body is placed beneath the surface of sea, a man sitting on the shore observes
(Take, speed of sound in air and sea water as 330 m s^{-1} and 1530 m s^{-1} respectively)

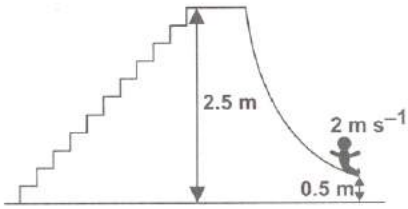
(A) A sound of frequency 15 Hz (B) A sound of frequency 70 Hz
(C) A sound of frequency 55 Hz (D) No sound.

13. A student, while doing an experiment on tracing the path of a ray of light passing through a rectangular glass slab, measured the three angles marked as θ_1, θ_2 and θ_3 in figure. His measurements could be correct if he were to find



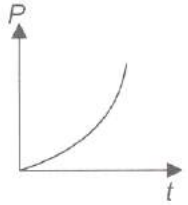
(A) $\theta_1 < \theta_2 < \theta_3$ (B) $\theta_1 < \theta_2$, but $\theta_1 = \theta_3$
(C) $\theta_1 > \theta_2 > \theta_3$ (D) $\theta_1 > \theta_2$, but $\theta_2 = \theta_3$

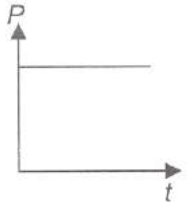
14. At a playground, a boy of 40 kg climbs up a concrete slide of height 2.5 m. He then slides down the slope which has a length of 6 m. His velocity at the end of the slope is 2 m s^{-1}. The average frictional force against the boy's motion along the slope, is (Take g = 10 m s^{-2})

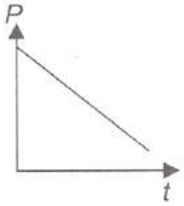


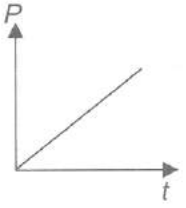
(A) 100 N (B) 120 N
(C) 150 N (D) 180 N

15. A constant force is applied to a body which is initially stationary but free to move in the direction of the force. Assuming that the effects of friction are negligible, which of the following graphs best represents the variation of power supplied with time?

(A) 

(B) 

(C) 

(D) 

16. Two spherical planets PI and PII have masses and densities in the ratio 1 : 2 and 4 : 1 respectively. Then the ratio of acceleration due to gravity at the surface of PI to that at the surface of PII is

(A) 1 : 2 (B) 2 : 1 (C) 4 : 1 (D) 1 : 4

17. **Read the given statements and select the correct option.**

Statement 1 : The two arms of a tuning fork vibrate with same frequency.

Statement 2 : Both arms of the tuning fork send sound wave in the same direction.

(A) Both statements 1 and 2 are true and statement 2 is the correct explanation of statement 1.

(B) Both statements 1 and 2 are true but statement 2 is not the correct explanation of statement 1.

(C) Statement 1 is true but statement 2 is false.

(D) Both statements 1 and 2 are false.

18. **A small metallic sphere is dropped from a great height. Initially, it falls freely, but after a long time, it acquires a constant velocity. It then completes its downward motion with that velocity. Which of the following statements is correct?**

(A) Kinetic energy of the sphere first decreases and then becomes constant.

(B) Potential energy of the sphere first increases and then becomes constant.

(C) Kinetic energy of the sphere always increases.

(D) Potential energy of the sphere always decreases.

19. **Four processes are used to charge an isolated metal sphere.**

P_1 : The sphere is earthed by touching it.

P_2 : The earth connection is removed from the sphere.

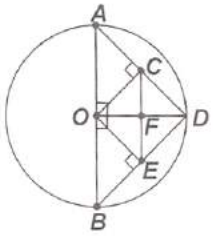
P_3 : A charged rod is brought close to the sphere.

P_4 : The charged rod is removed.

In which order should these processes be carried out to charge the sphere?

(A) $P_1 \rightarrow P_2 \rightarrow P_3 \rightarrow P_4$ (B) $P_1 \rightarrow P_3 \rightarrow P_4 \rightarrow P_2$ (C) $P_3 \rightarrow P_1 \rightarrow P_2 \rightarrow P_4$ (D) $P_3 \rightarrow P_4 \rightarrow P_1 \rightarrow P_2$

20. **The given figure shows a circular park of radius *R* whose centre is at *O*. Three friends *X*, *Y* and *Z* start from point *A* and reach point *B* via different paths. The paths followed by *X*, *Y* and *Z* are *ACDEB*, *ACOEB* and *ACFEB* respectively. Then the ratio of distances travelled by *X*, *Y* and *Z* is**



(A) $\sqrt{2} : 2 : (2\sqrt{2}+1)$ (B) $4 : 4 : (2+\sqrt{2})$

(C) $\sqrt{2} : \sqrt{2} : 1$ (D) $4 : 1 : (4-2\sqrt{2})$

CHEMISTRY

21. **Some properties of five substances are shown in the given table. At room temperature, which of the following statements are incorrect?**

Substance	Melting point (°C)	Boiling point (°C)	Electrical conductivity
P	44	280	Poor
Q	–7.2	59	Poor
R	–101	–35	Poor
S	–39	357	Good
T	660	2470	Good

I. *R* is a liquid non-metal.

II. *T* is used for electrical wiring.

III. *P* is a solid non-metal.

IV. *Q* is a gaseous non-metal.

V. *S* is a solid metal.

(A) I, III and V (B) I, IV and V (C) II and III (D) All of these

22. **Which of the following will have mass equal to 8 g? (Atomic mass of O = 16 u)**

I. **0.5 mole of O_2 gas**

II. **0.5 mole of O atoms**

III. **6.022×10^{23} molecules of O_2**

IV. **3.011×10^{23} atoms of O**

(A) II and IV (B) II and III (C) I and III (D) None of these

23. **The masses of cane sugar and water required to prepare 350 g of 15% solution of cane sugar are respectively**

(A) 50.2 g, 295.7 g (B) 297.5 g, 52.5 g (C) 52.5 g, 297.5 g (D) 62.5 g, 187.5 g

24. The given table shows the composition of six particles, represented by the letters *M* to *R*. The particles are atoms or ions. (The letters are not the symbols of the elements.) Fill in the blanks by choosing an appropriate option. The two particles which are an atom and a positive ion of the same element are _1_ and _2_ respectively. The other two particles which are an atom and a negative ion of the same element are _3_ and _4_ respectively.

Particle	Number of		
	Electrons	Protons	Neutrons
M	8	8	8
N	10	8	8
O	10	8	10
P	10	12	12
Q	10	11	12
R	12	12	12

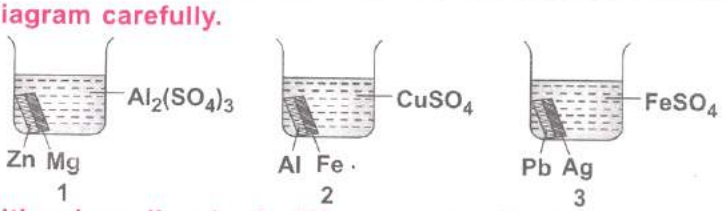
	1	2	3	4
(A)	*P*	*Q*	*M*	*O*
(B)	*N*	*M*	*P*	*R*
(C)	*P*	*R*	*O*	*N*
(D)	*R*	*P*	*M*	*N*

25. Match the column I with column II and select the correct option from the given codes.

Column I (Polymer)	Column II (Used to make)
(P) Bakelite	1. Water tanks
(Q) Nylon	2. Ropes, mats
(R) Coir	3. Radio, telephone set
(S) PVC	4. Fishing net

	P	Q	R	S
(A)	3	2	4	1
(B)	3	4	2	1
(C)	1	3	4	2
(D)	4	3	1	2

26. Observe the given diagram carefully.



Match the column I with column II and select the correct option from the given codes.

Column I	Column II
(i) Both the metal strips dissolve	p. Beaker 1
(ii) Reaction takes place but no colour change	q. Beaker 2
(iii) None of the metal strips dissolves	r. Beaker 3

(A) (i) - p, (ii) - q, (iii) - r (B) (i) - r, (ii) - q, (iii) - p (C) (i) - q, (ii) - r, (iii) - p (D) (i) - q, (ii) - p, (iii) - r

27. In Rutherford's gold foil experiment, most of the α-particles passed through the gold foil without any deviation from their paths. This indicates that

(A) The atom is spherical

(B) There is a positively charged nucleus at the centre of the atom

(C) The entire mass of the atom is concentrated at the nucleus of the atom

(D) Most of the space inside the atom is empty.

28. Read the given statements and select the correct option.

Statement 1 : The colour of LPG flame is blue while a candle flame is yellow.

Statement 2 : LPG undergoes complete combustion while wax undergoes incomplete combustion.

(A) Both statements 1 and 2 are true and statement 2 is the correct explanation of statement 1.

(B) Both statements 1 and 2 are true but statement 2 is not the correct explanation of statement 1.

(C) Statement 1 is true and statement 2 is false.

(D) Both statements 1 and 2 are false.

29. Read the following statements carefully.

(i) Coal, petroleum and natural gas are called fossil fuels.

(ii) Coal and natural gas are two exhaustible substances.

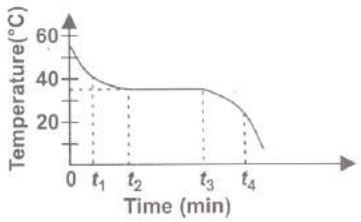
(iii) Coal gas is used as a source of heat.

(iv) Fossil fuels are present in limited quantities.

The correct statements are

(A) (i) and (ii) (B) (i) and (iv) (C) (i), (ii) and (iii) (D) All of these.

30. A beaker containing hot liquid '*P*' is placed on a table in a room. Changes in temperature of the beaker and its contents are shown in the given diagram.



Which of the following statements are correct?

I. At time t_2, *P* begins to freeze.

II. At time t_2 and t_3, hot liquid and cold liquid exist in equilibrium.

III. The boiling point of *P* is 35°C.

IV. At time t_4, *P* exists in the solid state.

(A) II and III (B) I and IV (C) I, III and IV (D) All of these

31. Mrs. Sangeeta, a science teacher has given a mixture containing benzene and dilute solution of sodium chloride in water to four students. She asked them to obtain samples of benzene and solid sodium chloride from the mixture.

The techniques used by students are listed in the given table.

Student	First technique	Second technique
P	Use a separating funnel	Filtration
Q	Distillation	Filtration
R	Filtration	Crystallization
S	Use a separating funnel	Evaporation

The correct techniques are adopted by

(A) Student *Q* (B) Student *R* (C) Student *P* (D) Student *S*.

32. Find the incorrect match.

(A) Thermoplastic – Bakelite (B) Synthetic fibre – Rayon

(C) Cotton and woollen clothes – Biodegradable (D) Fire-proof plastic – Melamine

33. Phosphorus is stored in water while sodium is stored in kerosene because

(A) Non-metals react with oxygen and water vigorously while metals do not react with water.

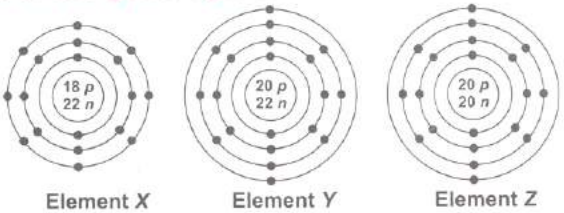
(B) Metals react vigorously with oxygen and water while non-metals do not react with water.

(C) They are non-reactive towards air.

(D) None of these.

34. The electronic arrangements of three elements are shown in the given figure. Mark the correct option.

	Isobars	Isotopes
(A)	*X* and *Y*	*Y* and *Z*
(B)	*Y* and *Z*	*X* and *Z*
(C)	*Z* and *X*	*X* and *Y*
(D)	*X* and *Z*	*Y* and *Z*



Element *X* Element *Y* Element *Z*

35. Copper oxide was obtained by two different methods. In method I, 1.75 g of copper gave 2.19 g of copper oxide while in method II, 1.14 g of copper gave 1.43 g of copper oxide. This illustrates the

(A) Law of multiple proportions (B) Law of constant proportions

(C) Law of reciprocal proportions (D) Dalton's atomic theory.

36. **Saurabh conducted an experiment to find the efficiency of two different fuels. 2.5 kg of fuel 1 on complete burning, produced 180,000 kJ of heat while 3.0 kg of fuel 2 produced 120,000 kJ of heat. Which fuel is more efficient and why?**

(A) Fuel 1 because its calorific value is 72,000 kJ/kg.

(B) Fuel 2 because its calorific value is 40,000 kJ/kg.

(C) Both fuels are equally efficient as large amount of heat is produced on burning few kilograms of fuel.

(D) Fuel 1 because its calorific value is 40,000 kJ/ kg.

37. **Read the following statements carefully.**

***X*: It is used in the manufacture of steel and in the extraction of many metals.**

***Y*: It is a petroleum product, used in place of coal tar for metalling the roads.**

***Z*: It is obtained from natural gas and is used in the production of fertilisers.**

***X*, *Y* and *Z* are respectively**

(A) Coal tar, Coke and Nitrogen (B) Coke, Bitumen and Hydrogen

(C) Black gold, Diesel and Hydrogen (D) Bitumen, Petrol and LPG.

38. **The molecular formula of boron sulphide is B_2S_3. Read the given statements about this compound carefully. (Atomic mass of B = 11 u and S = 32 u)**

1. **One mole of boron sulphide contains 96 g of sulphur.**
2. **The percentage by mass of boron in boron sulphide is 81.4%.**
3. **The empirical formula of boron sulphide is B_2S_3.**

The incorrect statement(s) is/are

(A) 1 and 3 (B) 1, 2 and 3 (C) 2 only (D) None of these.

39. **The given table shows number of grams of four different substances dissolved in 100 g of water, ethanol and chloroform at 20°C.**

Solvent	Substances			
	I	II	III	IV
Water	38.0	202.0	0.8	110.0
Ethanol	0.0	0.0	22.0	18.0
Chloroform	0.0	0.0	4.0	0.0

The substance which dissolves best in water at 20°C and the substance which has maximum solubility in ethanol are respectively

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

40. **Which of the following phenomena shows that diffusion has occurred?**

1. **Mothballs become smaller when exposed to air.**
2. **Balloons deflate and become smaller.**
3. **The aroma of coffee spreads through the air.**
4. **A puddle of water disappears on hot days.**

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

BIOLOGY

41. **In an experiment, a scientist removed the nucleolus from a single-celled eukaryote. The organism could not survive. What could be the reason for this?**

(A) It could not obtain energy by respiration.

(B) It could not undergo cell division because spindle could not be formed.

(C) It could not modify and transport the metabolites produced in its body.

(D) It could not manufacture its proteins.

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(B) Fuel 2 because its calorific value is 40,000 kJ/kg.

(C) Both fuels are equally efficient as large amount of heat is produced on burning few kilograms of fuel.

(D) Fuel 1 because its calorific value is 40,000 kJ/ kg.

37. **Read the following statements carefully.**

***X*: It is used in the manufacture of steel and in the extraction of many metals.**

***Y*: It is a petroleum product, used in place of coal tar for metalling the roads.**

***Z*: It is obtained from natural gas and is used in the production of fertilisers.**

***X*, *Y* and *Z* are respectively**

(A) Coal tar, Coke and Nitrogen

(B) Coke, Bitumen and Hydrogen

(C) Black gold, Diesel and Hydrogen

(D) Bitumen, Petrol and LPG.

38. **The molecular formula of boron sulphide is B_2S_3. Read the given statements about this compound carefully. (Atomic mass of B = 11 u and S = 32 u)**

1. **One mole of boron sulphide contains 96 g of sulphur.**
2. **The percentage by mass of boron in boron sulphide is 81.4%.**
3. **The empirical formula of boron sulphide is B_2S_3.**

The incorrect statement(s) is/are

(A) 1 and 3 (B) 1, 2 and 3 (C) 2 only (D) None of these.

39. **The given table shows number of grams of four different substances dissolved in 100 g of water, ethanol and chloroform at 20°C.**

Solvent	Substances			
	I	II	III	IV
Water	38.0	202.0	0.8	110.0
Ethanol	0.0	0.0	22.0	18.0
Chloroform	0.0	0.0	4.0	0.0

The substance which dissolves best in water at 20°C and the substance which has maximum solubility in ethanol are respectively

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

40. **Which of the following phenomena shows that diffusion has occurred?**

1. **Mothballs become smaller when exposed to air.**
2. **Balloons deflate and become smaller.**
3. **The aroma of coffee spreads through the air.**
4. **A puddle of water disappears on hot days.**

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

BIOLOGY

41. **In an experiment, a scientist removed the nucleolus from a single-celled eukaryote. The organism could not survive. What could be the reason for this?**

(A) It could not obtain energy by respiration.

(B) It could not undergo cell division because spindle could not be formed.

(C) It could not modify and transport the metabolites produced in its body.

(D) It could not manufacture its proteins.

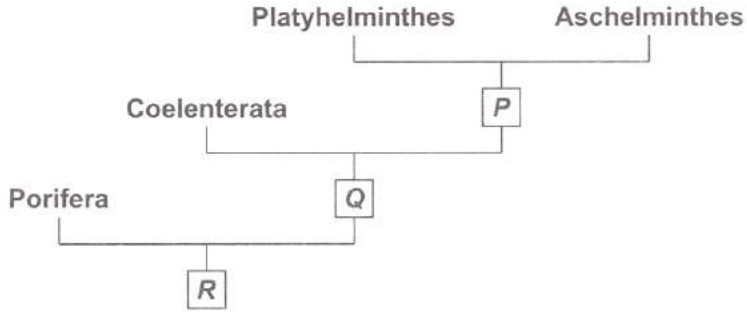
42. Ravi was studying a permanent slide of a tissue and noted down the following observations in his note book.

- **Cells lack walls and are pillar-like in appearance.**
- **A single, centrally placed nucleus is present in all the cells.**
- **No cilia or flagella are present.**

In which of the following specimens can you find this type of tissue?

(A) Internodal section of maize stem
(B) Section of a human blood vessel
(C) Section of human oviducts cut from end near the ovary
(D) None of these

43. A cladogram drawn by a student is shown here.



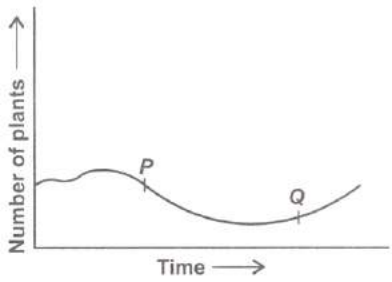
Select the option that correctly identifies the character *P*, *Q* or *R*.

(A) *P* represents presence or absence of mesodermal layer.
(B) *Q* represents presence or absence of bilateral symmetry.
(C) *R* represents presence or absence of coelom.
(D) *P* represents presence or absence of tissue organisation.

44. Read the given statements and select the correct option regarding them.
Statement 1 : STDs do not spread by casual physical contact, like handshakes etc.
Statement 2 : STD microbes are communicated by exchange of body fluids only.

(A) Both statements 1 and 2 are true and statement 2 is the correct explanation of statement 1.
(B) Both statements 1 and 2 are true but statement 2 is not the correct explanation of statement 1.
(C) Statement 1 is true but statement 2 is false.
(D) Both statements 1 and 2 are false.

45. Refer to the given graph which shows the changes in number of all the plants present in a pond over a period of time. Which of the following can be concluded from the graph?



(A) At time *P*, a new exotic plant species was introduced in the pond.
(B) At time *P*, a large amount of nitrate and phosphate fertilisers was washed down into the pond.
(C) At time *Q*, an oil spill occurred in the pond from a nearby factory.
(D) At time *Q*, the oxygen concentration in the pond increased dramatically due to input of sewage.

46. Match the column I with column II and select the correct option from the given codes.

Column I	**Column II**
a. Echo-sounders	**(i) Pisciculture**
b. Frieswal	**(ii) Poultry farming**
c. Polymorphic species	**(iii) Fisheries**
d. Ranikhet disease	**(iv) Cattle farming**
e. Fish rearing	**(v) Apiculture**

(A) a - (i), b - (ii), c - (iii), d - (iv), e - (v)
(B) a - (i), b - (v), c - (ii), d - (iv), e - (iii)
(C) a - (iii), b - (iv), c - (v), d - (ii), e - (i)
(D) a - (v), b - (iv), c - (iii), d - (ii), e - (i)

47. Read the following statements.

I. _____ is a traditional method of irrigation while _____ is a modern one.

II. _____ is used for irrigation in places where water availability is poor.

III. _____ are used for large scale storage of grains.

IV. The strong triangular part of the plough is called _____ while the long rod is called _____ .

Select the option which correctly fills the blanks in any two of the given statements.

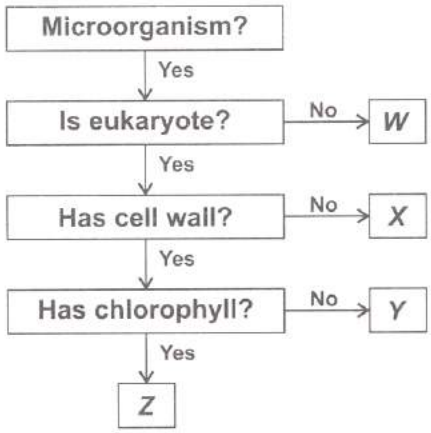
(A) I - Chain pump, Sprinkler system; III - Silos

(B) II - Drip system; IV - Plough shaft, Ploughshare

(C) III - Granaries; IV - Hoe, Ploughshare

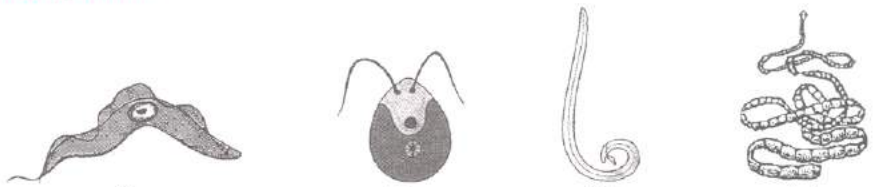
(D) I - Rahat, Chain pump; II-Sprinkler system

48. Study the given flow chart and select the option that correctly identifies the microorganisms *W*, *X*, *Y* and *Z*.



	W	*X*	*Y*	*Z*
(A)	Yeast	*Penicillium*	*Agaricus*	*Spirogyra*
(B)	*Amoeba*	Yeast	*Rhizopus*	*Lactobacillus*
(C)	*Lactobacillus*	*Trypanosoma*	Yeast	*Chlamydomonas*
(D)	Yeast	*Penicillium*	*Spirogyra*	*Trypanosoma*

49. Refer to the organisms (i), (ii), (iii) and (iv) shown in the given figures and select the incorrect statement regarding them.



(i) (ii) (iii) (iv)

(A) Organism (i) lives in blood plasma of humans, enters cerebrospinal fluid and damages the brain.

(B) Organism (ii) lives in large intestine of humans and infection occurs by ingesting cysts along with food and water.

(C) Organism (iii) lives in small intestine of humans and infection occurs by ingesting soil infected with its eggs.

(D) Organism (iv) lives in small intestine of humans and infection occurs by eating infected pork.

50. Which of the following statements is correct for the organism shown in the picture?

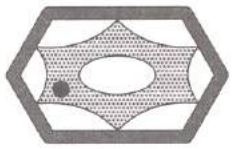
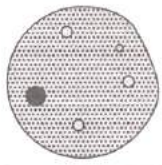
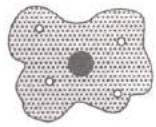
(A) This organism became extinct due to invasion of exotic species.

(B) The IUCN category to which this organism belongs also contains Quagga and Tasmanian wolf.

(C) This organism is listed in Red Data Book under the extinct in wild category.

(D) This organism is critically endangered due to continuous illegal poaching.

51. Select the option that correctly represents a *Zea mays* cell placed in 10% sucrose solution.

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

52. Sumit was studying the rate of reproduction process of an organism '*X*'. He recorded the data obtained in a table as shown here:

Time	Number of individuals
12:00 PM	1
12:03 PM	8
12:06 PM	64

Which of the following options is correct regarding the organism '*X*'?

(A) It reproduces every minute by multiple fission.
(B) It reproduces every minute by binary fission.
(C) It reproduces every two minutes by budding.
(D) No assumptions can be made based on the given data.

53. The hormone estrogen stimulates development of secondary sexual characters in adolescents of a particular sex. Its effects include _____.

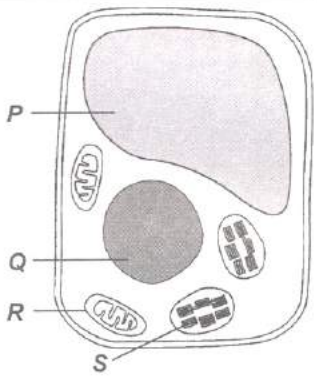
(A) Broadening of shoulders
(B) Deepening of voice
(C) Growth of hair in armpits, pubic area and on face
(D) Widening of pelvic region

54. Acid rain occurs when sulphur dioxide and nitrogen oxides combine with water vapours in atmosphere and fall as rain. Which of the following is not caused by acid rain?

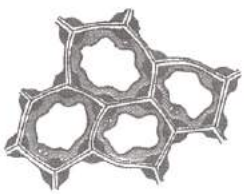
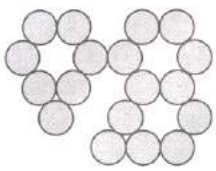
(A) Decreased quality of air
(B) Reduced growth of forests
(C) Reduced pH of water bodies
(D) Destruction of marble buildings

55. Refer to the given diagram of cell. Which of the labelled structures carry out the following two functions?

	Maintains rigidity of the cell	Oxidises carbohydrates
(A)	*Q*	*S*
(B)	*Q*	*P*
(C)	*P*	*R*
(D)	*P*	*S*



56. Ritu cut a section through stem of a dicotyledonous herb and observed it under a high power microscope. Which of the following tissues will she most likely observe in the region just below the epidermis?

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

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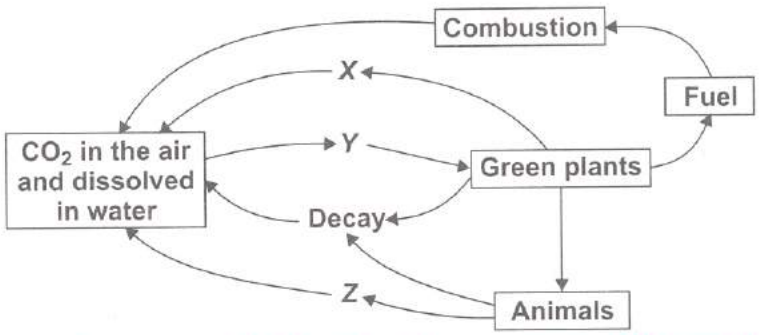

Which of the following options correctly identifies the processes *X*, *Y* and *Z*?

(A) *Y* is the process on which all the living organisms depend directly or indirectly for food.

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60. Ramesh has grown wheat in the last cropping season. Now, he is preparing his field for sowing new crop. Which of the following crops he should select to obtain maximum produce?

(A) Rice (B) Gram (C) Soya bean (D) Barley

MATHEMATICS

61. If $x = \frac{15}{\sqrt{10}+\sqrt{20}+\sqrt{40}-\sqrt{5}-\sqrt{80}}$, then find the value of $\frac{1}{x^2}$.

(A) $\frac{3-2\sqrt{5}}{5}$ (B) 1 (C) 0 (D) $\frac{1}{5}$

62. Find the mean of $(x + 5)$ observations, having sum $x^4 - 625$.

(A) $(x + 5)^2(x - 5)^2$ (B) $(x - 5)(x^2 + 25)$ (C) $(x + 5)^2(x - 5)$ (D) $(x + 5)(x^2 + 25)$

63. The polynomial $f(x) = (x - 3)(x + 2)(ax + b) - 16$ leaves a remainder of 8 and -4 when divided by $x + 1$ and $x + 3$ respectively. Find the values of a and b respectively.

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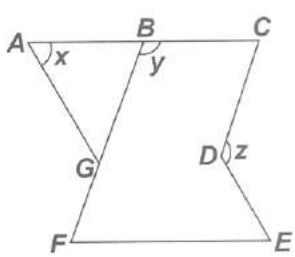
64. In the figure, not drawn to scale, *ABC* is a straight line. Given that $AC \| FE$ and $BF \| CD$, $\angle BGA = 75°$, $\angle BFE = 50°$ and $\angle DEF = 42°$, find the values of x, y and z respectively.



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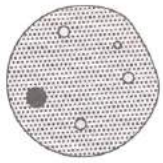
(B) 

(C) 

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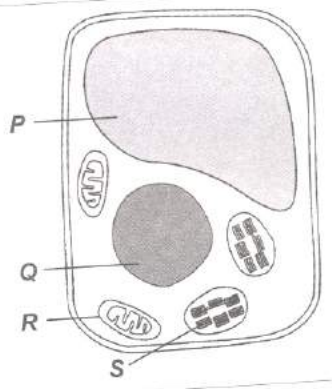

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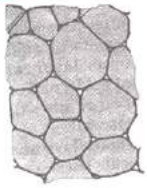
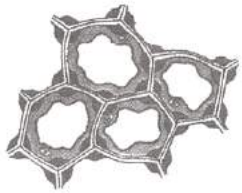
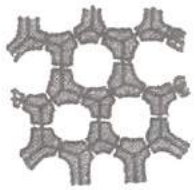
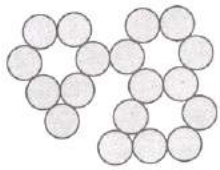
(A) 

(B) 

(C) 

(D) 

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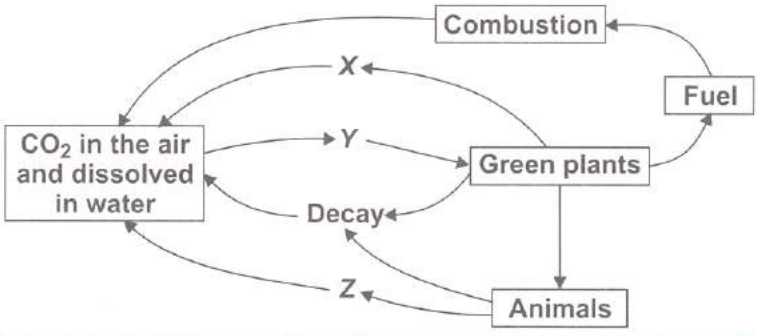

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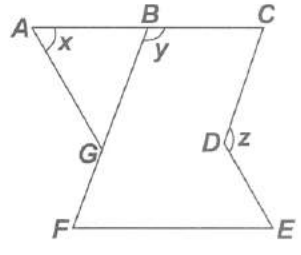


(A) 50°, 150°, 92°

(B) 55°, 130°, 92°

(C) 55°, 130°, 97°

(D) 55°, 150°, 92°

65. The given pie chart shows Mrs. Sneha's expenditure in a particular month. If she spent a total of ₹ 2400, then find the amount of money spent by her on the transport.

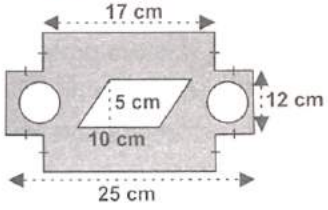
(A) ₹ 240

(B) ₹ 200

(C) ₹ 120

(D) ₹ 180

66. Find the ratio of area of the shaded region to the unshaded region in the given figure, if the diameter of two identical circles is 2 cm. (Take $\pi = 3.14$)



(A) 3797 : 562

(B) 9493 : 1407

(C) 9436 : 1407

(D) 1407 : 436

67. *P* bought a tape recorder for ₹ 8,000 and sold it to *Q*. *Q* in turn sold it to *R*, each earning a profit of 20%. Which of the following option is true?

(A) *P* and *Q* earns the same profit.

(B) *P* earns more profit than *Q*.

(C) *P* earns less profit than *Q*.

(D) Cannot be decided.

68. If on increasing *a*, *b* decreases in such a manner that _____ remains _____ and positive, then *a* and *b* are said to vary inversely with each other.

(A) *ab*, constant (B) *ab*, varying (C) $\frac{a}{b}$, constant (D) $\frac{a}{b}$, varying

69. Find the value of $\frac{4}{(216)^{-2/3}} \div \frac{1}{(256)^{-3/4}} \div \frac{2}{(243)^{-1/5}}$.

(A) $\frac{8}{3}$ (B) $\frac{3}{8}$ (C) $\frac{1}{6}$ (D) $\frac{5}{8}$

70. Select the correct match.

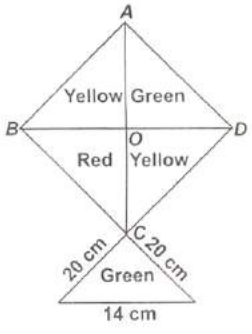
(A) $48^3 - 30^3 - 18^3 = 777600$

(B) $30^3 - 12^3 - 18^3 = 19940$

(C) $29^3 - 17^3 - 12^3 = 17748$

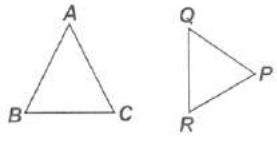
(D) $(0.2)^3 - (0.3)^3 + (0.1)^3 = 0.0018$

71. How much paper of each shade is needed to make a kite given in figure, in which *ABCD* is a square with diagonal 44 cm.



	Red	Yellow	Green
(A)	121 cm^2	242 cm^2	242 cm^2
(B)	242 cm^2	484 cm^2	242 cm^2
(C)	121 cm^2	484 cm^2	242.04 cm^2
(D)	242 cm^2	484 cm^2	373.14 cm^2

72. In the triangles *ABC* and *PQR*, if $\angle A = \angle P$, $AB = PQ$ and $PQ = PR$, then which of the following option is true?



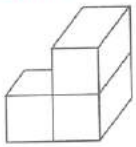
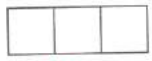
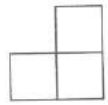
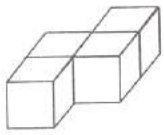
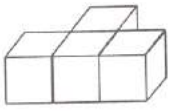
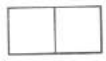
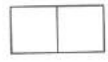
(A) $\Delta ABC \cong \Delta QPR$

(B) $\angle B = \angle C$ and $\Delta ABC \cong \Delta PQR$

(C) $BC = PR$ and $\Delta ABC \cong \Delta PQR$

(D) None of these

73. Match solid in column I with their side view in column II & front view in Column III.

	Column I Solid	Column II Side view	Column III Front view
(a)		 (i)	 (p)
(b)		 (ii)	 (q)
(c)		 (iii)	 (r)

(A) (a) - (ii) - (p); (b) - (iii) - (q); (c) - (i) - (r)
(B) (a) - (ii) - (p); (b) - (i) - (r); (c) - (iii) - (q)
(C) (a) - (ii) - (p); (b) - (iii) - (r); (c) - (i) - (q)
(D) (a) - (iii) - (p); (b) - (i) - (r); (c) - (ii) - (p)

74. Identify the wrong step(s) Seema has done while solving the given problem for x.

$(x - 4)(x - 2) = (x^2 - 8)$
Step - I : $x(x - 2) - 4(x - 2) = x^2 - 8$
Step - II : $x^2 - 2x - 4x + 8 = x^2 - 8$
Step - III : $x^2 - 6x + 8 = x^2 - 8$
Step - IV : $x^2 - 6x + 8 - x^2 + 8 = 0$
Step - V : $-6x + 16 = 0$
Step - VI : $6x = 16$
Step - VII : $x = 16 \div 6 = 8 \div 3 = \frac{8}{3}$

(A) Step II, III & IV **(B)** Step II, IV & VI **(C)** Only Step VII **(D)** All steps are correct.

75. A student is asked to find n, which is 5% of 32. He has used the proportion $\frac{n}{100} = \frac{5}{32}$. If he used wrong proportion, what should be the right proportion?

(A) He should use $\frac{n}{100} = \frac{32}{5}$ to find n.
(B) He should use $\frac{n}{32} = \frac{5}{100}$ to find n.
(C) He should use $\frac{n}{100} = \frac{32}{5} \times 100$ to find n.
(D) He used right proportion.

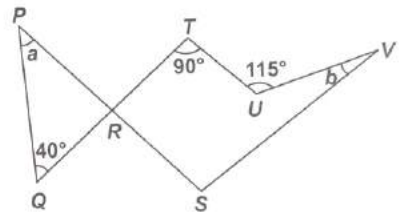
76. If $(2x + 5)$ is a factor of $2x^2 - k$, then value of k is _____.

(A) $\frac{-25}{2}$ **(B)** -1 **(C)** 25 **(D)** $\frac{25}{2}$

77. A point is defined as

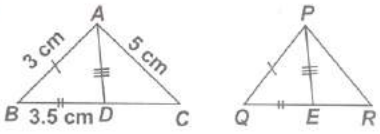
(A) That which has length, breadth, height.
(B) No small part of a line with no length.
(C) One dimension, but represented by dot only.
(D) None of these

78. If in the given figure, $TU \parallel SR$ and $TR \parallel SV$, then find a and b respectively.



(A) 50°, 25°
(B) 20°,65°
(C) 45°,55°
(D) 95°, 35°

79. In the given figures, AD and PE are the medians. Then value of PR is



(A) 7 cm
(B) 3 cm
(C) 5 cm
(D) 6 cm

80. Match Statement with Column I and Column II.

Statement : The co-ordinates of a point whose ordinate is –5 and abscissa is 4, is

Column I	Column II
(a) lying in Ist quad.	(i) having (ordinate, abscissa)
(b) lying in IInd quad.	(ii) having (–ordinate, abscissa)
(c) lying in IIIrd quad.	(iii) having (abscissa, ordinate)
(d) lying in IVth quad.	(iv) having (– abscissa, – ordinate)

(A) b and (iii) (B) a and (i) (C) c and (iii) (D) d and (iii)

81. In a family with two sons, a father has a field in the form of a right angled triangle with perpendicular sides 18 m and 40 m. He wants to give independent charge to his sons, so he divided the field in the ratio 2 : 1 : 1. If the bigger part he kept for himself, then find the total area distributed to the sons.

(A) 360 m^2 (B) 90 m^2 (C) 180 m^2 (D) 200 m^2

82. Which of the following option is correct?

(A) Number of sides of regular polygon $= \dfrac{360^\circ}{180^\circ - \text{each interior angle}}$

(B) Each interior angle of a regular polygon of n sides $= \dfrac{n \times 180^\circ}{n-2}$

(C) Each interior angle of a regular polygon of n sides $= \dfrac{(n-2)\times 90^\circ}{n}$

(D) Number of sides of polygon $= \dfrac{180^\circ}{360^\circ - 2(\text{each interior angle})}$

83. If $a^3 + b^3 + c^3 = 3abc$ and $a + b + c = 0$, then find the value of $\dfrac{(b+c)^2}{3bc} + \dfrac{(c+a)^2}{3ac} + \dfrac{(a+b)^2}{3ab}$.

(A) –1 (B) 3 (C) 1 (D) 0

84. $\dfrac{1}{(\sqrt{9}-\sqrt{8})} - \dfrac{1}{(\sqrt{8}-\sqrt{7})} + \dfrac{1}{(\sqrt{7}-\sqrt{6})} - \dfrac{1}{(\sqrt{6}-\sqrt{5})} + \dfrac{1}{(\sqrt{5}-\sqrt{4})}$ is equal to

(A) 0 (B) $\dfrac{1}{3}$ (C) 1 (D) 5

85. If one number is 80% of the other and 4 times the sum of their squares is 656, then the numbers are

(A) 4, 5 (B) 8, 10 (C) 16, 20 (D) None of these

86. The difference between the compound interest and the simple interest earned on a sum of money at the end of 4 years is ₹ 256.40. To find out the sum, which of the following informations given in the statements P and Q is/are necessary?

P : Amount of simple interest accrued after 4 years.

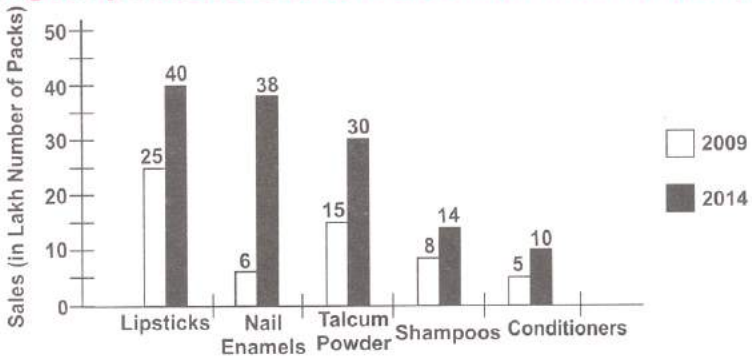
Q : Rate of interest per annum.

(A) Only P is necessary
(B) Only Q is necessary
(C) Either P or Q is necessary
(D) Neither P nor Q is necessary

87. A square and an equilateral triangle have equal perimeters. If the diagonal of the square is $12\sqrt{2}$ cm, then the area of the triangle is

(A) $24\sqrt{2}$ cm^2 (B) $24\sqrt{3}$ cm^2 (C) $48\sqrt{3}$ cm^2 (D) $64\sqrt{3}$ cm^2

88. A cosmetic company produces five different products. The sales of these five products (in lakh number of packs) during the years 2009 and 2014 are shown in the following bar-graph.



What is the approximate ratio of the total sales of five different products in year 2014 to that of in year 2009?

(A) 113 : 49 (B) 132 : 59 (C) 59 : 132 (D) 112 : 57

89. Two dice are thrown together. What is the probability that the product of the numbers on the two faces is divisible by 4?

(A) $\frac{1}{3}$ (B) $\frac{5}{12}$ (C) $\frac{4}{9}$ (D) $\frac{1}{2}$

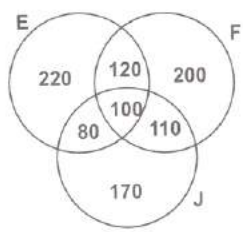
90. The heights of two right circular cones are in the ratio 1 : 2 and the perimeters of their bases are in the ratio 3 : 4. Find the ratio of their volumes.

(A) 9 : 32 (B) 3 : 16 (C) 9 : 16 (D) 3 : 8

91. If BE QUICK is coded as ZC OSGAI, then the code of the last letter of the third word in the sentence I LOVE MY COUNTRY is

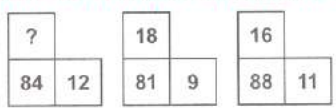
(A) A (B) T (C) U (D) W

92. A result of a survey of 1000 persons with respect to their knowledge of French (F), English (E) and Japanese (J) is given. What is the ratio of those who know all the three languages to those who do not know French?



(A) 20 : 47
(B) 1 : 10
(C) 10 : 47
(D) 5 : 47

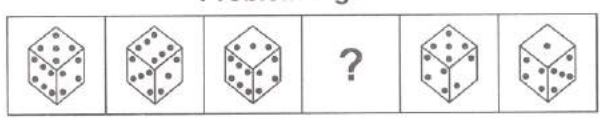
93. Find the missing number, if same rule is followed in all the three figures.

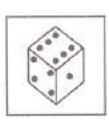
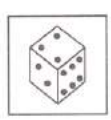


(A) 16 (B) 14 (C) 12 (D) 18

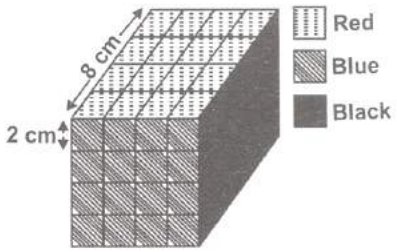
94. Select a figure from the options which will complete the series as established by the Problem Figures.

Problem Figures



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

95. A solid cube of each side 8 cm, has been painted red, blue and black on pairs of opposite faces. It is then cut into cubical blocks of each side 2 cm. How many cubes have three faces painted with different colours?



(A) 0
(B) 4
(C) 8
(D) 12

96. Which of the following vary inversely with each other?

(A) Speed and distance covered
(B) Distance covered and taxi fare
(C) Distance travelled and time taken
(D) Speed and time taken

97. A circle of maximum possible size is cut from a square sheet of board. Subsequently, a square of maximum possible size is cut from the resultant circle. What will be the area of the final square?

(A) $\frac{3}{4}$ of original square (B) $\frac{1}{2}$ of original square (C) $\frac{1}{4}$ of original square (D) $\frac{2}{3}$ of original square

98. A rectangular sheet of paper is rolled in two different ways to form two different cylinders. Find the ratio of volumes of cylinders, if the sheet measures 44 cm × 33 cm.

(A) 2 : 3 (B) 3 : 4 (C) 1 : 3 (D) 1 : 4

99. If $a = -1$ and $b = 2$, then find the value of $(a^b + b^a) \times (a^b - b^a) \times (a^b \times b^2) \times (a^b \div b^a)$.

(A) 1 (B) $\frac{1}{2}$ (C) 6 (D) 3

100. To construct a unique rectangle, the minimum number of measurements required is

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

SPACE FOR ROUGH WORK