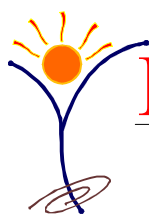


YOUNG SCIENTIST ACTIVITY BOOK

CLASS - IX

Sample Pages



EDUHEAL FOUNDATION

• LEARNING FOR LIFE •

DISCOVER • INVENT • EXPERIMENT • EXPLORE

CLASS - IX

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SYLLABUS GUIDELINES

Matter in our surroundings -

Characteristics and states of matter, Change of State and Evaporation

The fundamental unit of Life - Structure of a Cell, cell organelles

Motion - Uniform and Non-Uniform motion, distance-displacement, velocity and acceleration

Is matter around us pure -

Mixtures, types of mixtures, solution, colloids, Suspension

Methods of separation of mixtures, compounds, Element, Physical And Chemical Change

Tissues -

Types of plant tissues and animal tissues

Force and Laws of Motion -

Force, definition and its effects, Three laws of motion, Mass, Inertia and Conservation of Momentum

Atoms and Molecules -

Laws of Chemical combination, Definition of atoms and molecules, Chemical Formulae.

Diversity In Living Organisms - Classification of Plants

Classification of animals and nomenclature.

Gravitation -

Universal law of gravitation, free - fall, mass and weight.

Thrust and pressure, Archimedes principle, relative density.



Structure of Atom -

Atomic number, Mass number, Valency, Isotopes and Isobars

Electronic Distribution - Rutherford's Model and Bohr Model.

Diseases and its causes

Infectious and Non-infectious diseases,

Principles of treatment and prevention

Work and Energy -

Work done by a force, power and energy

Kinetic energy and potential energy, laws of conservation of energy

Natural Resources -

Air, water and soil, pollution of air and water.

Nitrogen Cycle, Carbon cycle, Water cycle, Oxygen Cycle, Green House Effect, Ozone Layer.

Sound -

Propagation of sound - longitudinal and transverse waves.

Characteristics of sound waves, structure of human ear (qualitative), Multiple reflection of sound. Application of Ultrasound

Improvement in food resources, Improvement in crop yield

Manure and fertilizers, cropping patterns, animal husbandry, poultry and fish farming, bee-keeping.



Put Spin On It

Eggs have a number of uses in our day-to-day life. Your birthday cake or the pastries you often eat has eggs. They form an important ingredient in many recipes. But besides this, can you imagine that an egg, too can help you in explaining laws of science. Come lets know how

You will Need

- ☺ Hard-boiled egg
- ☺ Uncooked egg

Here's How:

- 1 Spin the hard-boiled egg on a smooth surface. Stop the egg, then let it go right away.
- 2 Spin the uncooked egg on a smooth surface. Stop the egg, then let it go right away.
- 3 Watch what happens when you let go of the eggs.

What's Happening

The uncooked egg should spin a little even after you stop it. Newton's first law explains why: when an object is moving, it tends to continue moving at the same speed unless acted upon by an outside force. When you stop the uncooked egg, you stop the shell—the yolk and white are not attached to the shell so they keep moving.

After you have tried this a few times, you can amaze your family and friends—ask them to mix up the eggs, and then use what you've learned to figure out which egg is uncooked!



Why It Happens?

Q. Why Do Onions Make You Cry?

A. You might have avoided cooking, but probably you have cut up an onion and experienced the burning and tearing you get from the vapours.

When you cut an onion, you break cells, releasing their contents. Amino acid sulfoxides form sulphenic acids. Enzymes that were kept separate, now are free to mix with the sulphenic acids to produce propanethiol sulphur oxide, a volatile sulphur compound that wafts upward toward your eyes. This gas reacts with the water in your tears to form sulphuric acid. The sulphuric acid burns, stimulating your eyes to release more tears to wash the irritant away.



Cooking the onion inactivates the enzyme, so while the smell of cooked onions may be strong, it doesn't burn your eyes. Aside from wearing safety goggles or running a fan, you can keep from crying by refrigerating your onion before cutting it (slows reactions which can change the chemistry inside the onion) or by cutting the onion under water.

The sulphur-containing compounds also leave a characteristic odour on your fingers.

Q. Why Does Ice Float?

There are two parts to the answer for this question. First, let's take a look at why anything floats. Then, let's examine why ice floats on top of liquid water, instead of sinking to the bottom.

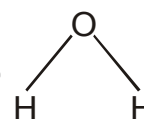


A substance floats if it is less dense, or has less mass per unit volume, than other components in a mixture. For example, if you toss a handful of rocks into a bucket of water, the rocks, which are dense compared to the water, will sink. The water, which is less dense than the rocks, will float. Basically, the rocks push the water out of the way, or displace it. For an object to be able to float, it has to displace a weight of fluid equal to its own weight.



Water reaches its maximum density at 4°C . As it cools further and freezes into ice, it actually becomes less dense. On the other hand, most substances are most dense in their solid (frozen) state than in their liquid state. Water is different because of hydrogen bonding.

A water molecule is made from one oxygen atom and two hydrogen atoms, strongly joined to each other with covalent bonds.



Ice floats because it is about 9% less dense than liquid water. In other words, ice takes up about 9% more space than water, so a litre of ice weighs less than a litre of water. The heavier water displaces the lighter ice, so ice floats to the top. One consequence of this is that lakes and rivers freeze from top to bottom, allowing fish to survive even when the surface of a lake has frozen over. If ice sank, the water would be displaced to the top and exposed to the colder temperature, forcing rivers and lakes to fill with ice and freeze solid.



Q. Can a Candle Burn in Zero Gravity?

A. Yes, a candle can burn in zero gravity. However, the flame is quite different. Fire behaves differently in space and microgravity than on Earth.



A microgravity flame forms a sphere surrounding the wick. Diffusion feeds the flame with oxygen and allows carbon dioxide to move away from the point of combustion, so the rate of burning is slowed. The flame of a candle burned in microgravity is an almost invisible blue colour.

Smoke and soot production is different for candles and other forms of fire in space or zero gravity compared to candles on earth. Unless air flow is available, the slower gas exchange from diffusion can produce a soot-free flame.

However, when burning stops at the tip of the flame, soot production begins. Soot and smoke production depends on the fuel flow rate.

● When scientists broke open molecules, they found they were only stuffed with atoms. But when they broke open atoms, they found them stuffed with explosions

● **Teacher:** What is the formula for water?

Student: H, I, J, K, L, M, N, O

Teacher: That's not what I taught you.

Student: But you said the formula for water was...H to O !!





Careful!

Do Not Ever Mix!!

Some of the common chemicals found in your home shouldn't be mixed together. It's one thing to say "don't mix bleach with ammonia", but it's not always easy to know what products contain these two chemicals. Here's are some products you may have around the home that shouldn't be combined.

☺ **Bleach with Acid Toilet Bowl Cleaners**

This mixture can result in toxic, potentially deadly fumes.

☺ **Bleach with Vinegar**

Vinegar is a type of acid. Toxic chlorine vapour is produced. Don't mix chlorine bleach with any acid.

☺ **Bleach with Ammonia**

Toxic, potentially lethal vapours are produced.

☺ **Different Brands of One Type of Product**

Don't mix different cleaners together. They may react violently, produce toxins, or become ineffective.

☺ **Highly Alkaline Products with Highly Acidic Products**

Acids and bases (alkalies) can react violently, presenting a splash hazard.

Acids and bases are caustic and may cause chemical burns.

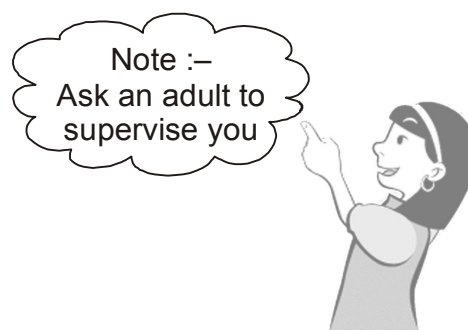


Balloon Inflating Without Blowing!

You often have to blow hard to inflate a balloon on birthdays or any other occasion. But in this experiment you will perform & see how a balloon inflates on its own.

You will need

- ☺ One small party balloon
- ☺ One small bottle.
- ☺ A kettle



What to do?

Boil the kettle. Ask the adult to put 1 tablespoon of water from the kettle into the empty bottle. The bottle will be very hot and full of steam at this point. Ask the adult to hold the bottle still on a table.

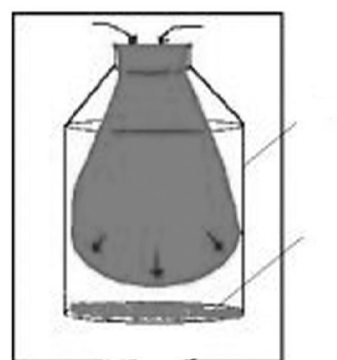
After 20 seconds stretch the opening of the party balloon over the mouth of the bottle. Now stand back and let the bottle cool off with the balloon covering the opening.

Notice that as the bottle cools, the balloon gets sucked into the bottle. If you had just the right amount of water left when you put the balloon on the bottle, the balloon will actually 'inflate' into the bottle until it fills the whole inside!

What is happening?

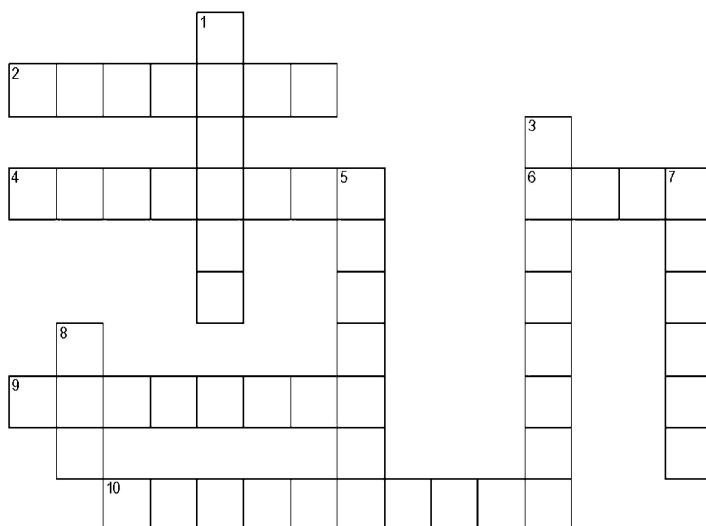
When water boils it becomes steam. As the water boils away, the steam fills the whole inside of the bottle. If you had just

taken the bottle and set it on the table to cool without adding the balloon, the steam would have cooled and condensed back into a very small amount of water. The water is smaller than the steam and takes up less space so more air is needed to fill the gap. This comes through the open bottle neck.



What you did in this experiment was put a rubber balloon in the way of the air trying to get back in the bottle and the balloon is pulled inside instead. If you were really lucky it would have inflated inside the bottle!

Cross Word Puzzle



Down

1. a positively charged particle found in the nucleus of an atom
3. a very small piece or part; an indivisible object
5. the central part of an atom
7. something that has mass which can exist in the form of a solid, liquid, gas or plasma

Across

2. a neutral particle made of three quarks found in the nucleus of an atom
4. a tiny particle with a negative charge which orbits an atom's nucleus
6. the smallest unit of a chemical element
9. two or more elements that are chemically joined
10. an instrument that uses lenses to produce magnified images of very small objects

Search for answers!



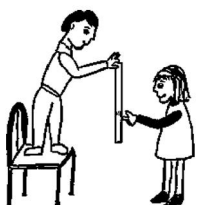
Quick or Slow ?

Reaction time, in humans, is the elapsed time between the receiving of stimuli & the subsequent reaction.

So, how quick do you think you are? With the help of a friend, you can find out.

Here's How:

Ask your friend to hold a wooden ruler (30 inch ruler) from the top so that it is up and down with the bottom several feet above the floor. Your friend may have to stand on a chair to do this.



You hold your fingers opposite the 18-inch mark, but don't touch the stick! Without warning your friend should let go of the yard stick, and you should try to catch it with your fingers.

Notice what inch mark your fingers are on when you catch the stick. Subtract this number from 18 or subtract 18 from the number to see how many inches the stick fell before you caught it. Try it several times to see if you get the same answer. Let your friend try to catch it while you drop it. Who has the quickest reaction time?

Your reaction time can be determined from the table below:

Distance dropped	Reaction time
2 inches	0.10 seconds
4 inches	0.14 seconds
6 inches	0.18 seconds
8 inches	0.20 seconds
10 inches	0.23 seconds
12 inches	0.25 seconds
14 inches	0.27 seconds
16 inches	0.29 seconds
18 inches	0.31 seconds

Why?



Why do you think it takes time for your fingers to react when your eyes see the stick start to fall? Can you think of reasons the reaction time might be different for an adult and a child? Perhaps you could test your theory with several adults and children.

Fun Science Facts

- The blue whale can produce sounds up to 188 decibels. This is the loudest sound produced by a living animal and has been detected as far away as 530 miles
- The human eye blinks an average of 4,200,000 times a year.
- The longest living cells in the body are brain cells which can live an entire lifetime.
- The hottest planet in the solar system is Venus, with an estimated surface temperature of 864 F (462°C).
- Hydrofluoric acid will dissolve glass.
- No matter its size or thickness, no piece of paper can be folded in half more than 7 times.
- Diamonds are the hardest substance known to man.
- The highest temperature on Earth was 136°F (58°C) in Libya in 1922.
- Chimps are the only animals that can recognize themselves in a mirror.
- The common goldfish is the only animal that can see both infra-red and ultra-violet light.
- Rats multiply so quickly that in 18 months, two rats could have over 1 million descendants.
- An Astronaut can be up to 2 inches taller returning from space. The cartilage disks in the spine expand in the absence of gravity.



Interactive Exercise : Chloroplasts and Mitochondria

Plant cells contain an organelle called the **chloroplast**. The chloroplast allows plants to harvest **energy** from **sunlight**. Specialized pigments in the chloroplast (including the common green pigment **chlorophyll**) absorb sunlight and use this energy to complete the chemical reaction:



In this way, plant cells manufacture **glucose** and other **carbohydrates** that they can store for later use. Photosynthetic cells may have **thousands** of chloroplasts. Chloroplasts are double membrane organelles with an inner membrane folded into disc-shaped sacs called **thylakoids**. *Colour and label* the outer membrane light green. Thylakoids, containing chlorophyll and other **accessory pigments**, are in stacks called **granum** (**grana**, plural). *Colour and label* the grana dark green in Figure 1. Grana are connected to each other by structures called lamellae, and they are surrounded by a gel-like material called **stroma**. *Colour and label* the lamellae brown in figure 1. *Colour and label* the stroma light blue in Figure 1. Light-capturing pigments in the grana are organized into **photosystems**. On Figure 2, *colour and label* a single thylakoid (stack) dark green. In another stack on figure 2, *colour and label* a granum red.

Mitochondria are the powerhouses of the cell. **Glucose** and other **carbohydrates** made by plants during photosynthesis are broken down by the process of **aerobic cellular respiration** in the mitochondria of the cell. This releases **energy (ATP)** for the cell. The more active a cell (such as a muscle cell), the more mitochondria it will have. The mitochondria are about the size of a bacterial cell and are often peanut-shaped. Mitochondria have a **double membrane**



like the nucleus and chloroplast. The **outer membrane** is smooth, while the **inner membrane** is convoluted into folds called **cristae**. *Colour and label* the outer membrane pink and the cristae red on figure 3. This greatly increases the surface area of the membrane so that carbohydrates (simple sugars) can combine with oxygen to produce ATP, **adenosine triphosphate** (the energy molecule of the cell). The **electron transport chain** takes place across the membranes of the **cristae** (crista, singular). Inside the folds or cristae is a space called the **matrix** that contains enzymes needed for the **Kreb's Cycle**. *Colour and label* the matrix yellow on figure 3.

Figure 1-Chloroplast

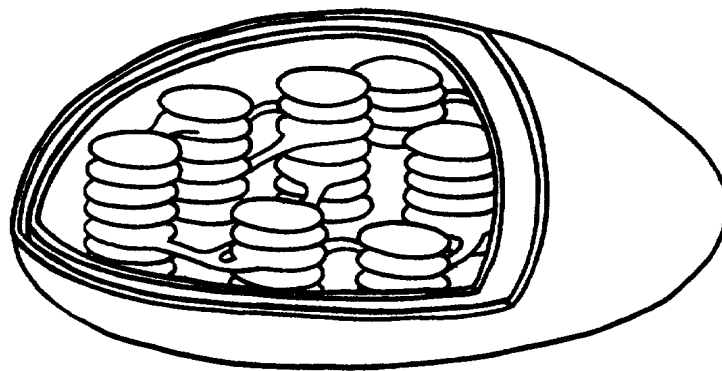


Figure 2-Thylakoid

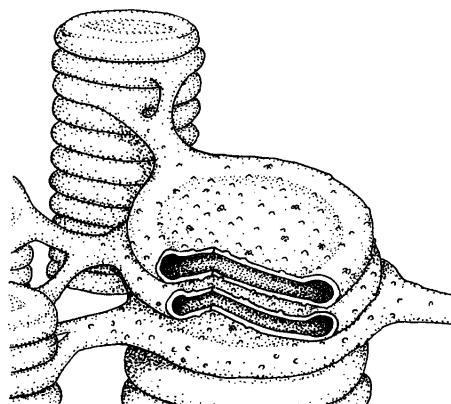
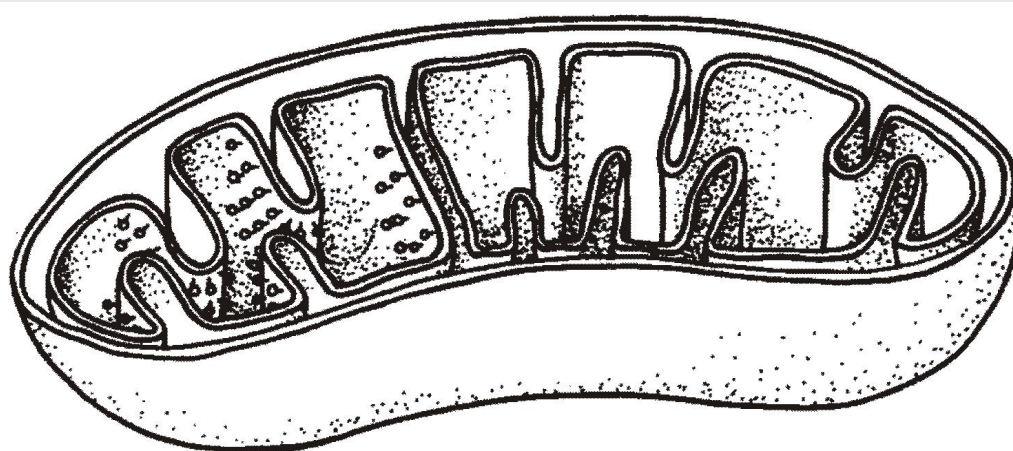


Fig. 3-Mitochondria



Now try to find out the answer of following Questions:

1. What is the energy molecule of the cell called?
2. What macromolecule made by plants is "burned" in the mitochondria?
3. Where is chlorophyll found in the chloroplast?
4. In which part of a plant would you expect to find the most chloroplasts and why?
5. How would the number of mitochondria in an insect's wing compare to the amount found in other cells in an insect's body? Explain your answer.
6. What are the raw materials for photosynthesis?
7. What product of photosynthesis is used in cellular respiration?
8. What is the advantage of having a folded inner membrane in the mitochondria?
9. What is the energy for photosynthesis?
10. Besides chlorophyll, what other pigments are found in the chloroplasts?

Nationwide Interactive Science Olympiad, 2007

Sample Paper

SCIENCE

1. Which of the following is correct
 - I. Evaporation is directly effected by surface area and temperature.
 - II. Distilled water is a solution
 - III. A beam of light shining through fog is an example of tyndall effect
 - IV. Coagulation can destroy a colloid
 - V. Oil & water form a homogenous solution.(a) II, III & IV (b) I, III & IV
(c) I, II & IV (d) All correct
2. Choose the correct pairs -
 - I. Parenchyma providing buoyancy to aquatic plants (u) Sclerenchyma
 - II. Mode of arrangement of organisms into groups according to a systematic plan (v) Kingdom
 - III. Tissue that supports internal organs and helps in repair of tissues (w) Aerenchyma
 - IV. Highest level in the hierarchy of classification (x) Areolar tissue
 - V. Permanent tissue present in husk of coconut (y) Classification(a) I-w; II-y; III-v; IV-X; V-u (b) I-w; II-y; III-x; IV-v; V-u
(c) I-y; II-x; III-w; IV-u; V-v (d) I-u; II-w; III-x; IV-y; V-v
3. One amu stands for (a) An atom of carbon (C^{12}) (b) $\frac{1}{12}$ th of carbon atom (C^{12})
(c) $\frac{1}{12}$ th of hydrogen atom (d) one atom of all atoms

4. Ramu's youngest brother was taken to the hospital to give a vaccination called BCG. This vaccination will provide protection against.
(a) Polio (b) Typhoid (c) Tuberculosis (d) Rabies
5. Which of the following is mis matched.
(a) Animal cell - outer layer is the cell wall
(b) Chloroplast - synthesis of food in plants
(c) Mitochondria - provides energy to perform activities
(d) Nucleus - controls the activities of the cell
6. Which of the following is correct:
i) Poles of a magnet can be separated
ii) Poles of a magnet donot exist separately
iii) Like poles attract and opposite poles repel.
iv) Magnetic poles always exist in pairs.
(a) i & iii (b) ii & iii (c) ii & iv (d) i & iii
7. The heat & light we get from the sun is due to a type of reaction called
(a) Solar reaction (b) Nuclear fusion reaction
(c) Fission reaction (d) None of the above
8. It is possible for two sound waves to meet and either cancel each other out or produce a much larger wave. This phenomenon is called
(a) refraction (b) interference
(c) resonance (d) diffraction.
9. Vibrations of sound are amplified several times in the ear by
(a) the pinna (b) Cochlea
(c) the hammer, anvil & stirrup of middle ear
(d) eardrum
10. Choose the correct answer(s)
i) Air has least refractive index
ii) When light travels from an optically denser to rarer medium it bends away from normal.

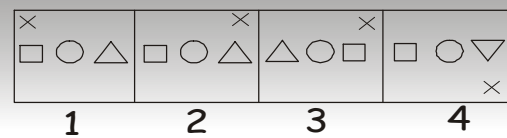
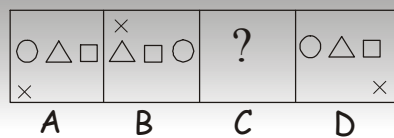


- iii) A concave lens is also known as diverging lens.
iv) If The image formed by a convex lens is real, inverted and very large, then the object must placed at infinity
(a) i & iii (b) ii & iii (c) ii & iv (d) All correct

MENTAL ABILITY

11. Read the following information to answer the question below it
Jayesh is taller than Mohan but shorter than Ashok. Shashi is taller than Mohan but shorter than Vijay.
Who among them is the tallest?
(a) Ashok (b) Vijay
(c) Either Vijay or Ashok (d) None of these
12. If out of 410 students, 240 study Spanish and 180 study French, If 25 students study neither language, how many study both?
(a) 25 (b) 35 (c) 60 (d) 170
13. I went 15 m to the North, then I turned West and covered 10m, then I turned South and covered 5m, and then turned East and covered 10m. In which direction am I from the starting point?
(a) East (b) West
(c) North-west (d) North
14. In a certain code '415' mean 'milk is hot'; '18' means 'hot soup' and '895' means 'soup is tasty'; what number will indicate the word 'tasty'
(a) 9 (b) 8 (c) 5 (d) 4
15. **Direction :** In the following question, there is a set of four figure labelled A, B, C and D called the problem set followed by a set of five other figures labelled 1, 2, 3, 4 and 5 called the Answer set fig. (c) contains a question-mark. Select a suitable figure from the answer set which will substitute this question-mark so that a series is formed by the figure A, B, C and D taken in order. The number of the selected figure is the answer.





COMPUTER

16. Why is a calculator, a calculator and not a computer
- It has no means of information input
 - It has no means of information output
 - It has no information holding device
 - It has no control portion
17. Computers cannot communicate with each other directly over telephone lines because they use digital pulses whereas telephone lines use analog sound frequencies. What is the name of the device which permits digital to analog conversion at the start of a long distance transmission?
- Interface
 - Modem
 - Attenuation
 - Teleprocessor
18. Match the following.
- | | |
|---|--|
| (1) Single programme Operating System(OS) | (A) Only one user program can be supported and execute by it at any point of time |
| (2) Multiprogram OS | (B) More than one user programs are loaded and active in the main store at the same time. |
| (3) Time Sharing OS | (C) Each active user program is given a fair share of CPU time (δ), if the time elapses or an I/O operation is requested, CPU shifts over to the next job waiting and the |

previous program is put to wait.

(4)Real Time OS

(d) Jobs have fixed deadlines.

(5)Multiprocessing OS

(e) Capable of handling more than one processes

(a) 1A, 2B, 3C, 4D, 5E

(b) 1B, 2C, 3D, 4E, 5A

(c) 1E, 2D, 3C, 4B, 5A

(d) 1C, 2D, 3B, 4E, 5A

19. Which of the following is true?

An application can be opened through shortcuts on desktop by

(a) Double clicking on its shortcut

(b) Right clicking and choosing "open" option

(c) Selecting the icon and pressing enter

(d) All of the above

20. WWW is -

(a) (World Wide Web) Usually means the universe of hypertext servers (HTTP servers) which allows text, graphics, sound files, etc. to be mixed together.

(b) (Internet Relay Chat)-Basically a huge multi-user live chat facility.

(c) Refers to the fact that Black widow spiders are found in all parts of the world and therefore have a world wide web.

(d) Browser

Answer key :-

1. (b) 2. (b) 3. (b) 4. (c) 5. (a)

6. (c) 7. (b) 8. (c) 9. (c) 10. (a)

11. (a) 12. (b) 13. (d) 14. (a) 15. (b)

16. (d) 17. (b) 18. (a) 19. (d) 20. (a)

