



DREAMLINE STEAM OLYMPIAD

7–8

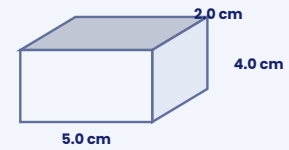
GRADE



Grade 7–8 Science Olympiad Sample Questions

1 • MEASUREMENT AND SCIENTIFIC QUANTITIES

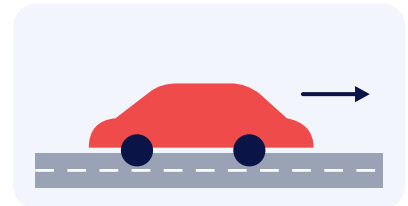
A rectangular metal block measures $5.0\text{ cm} \times 2.0\text{ cm} \times 4.0\text{ cm}$ and has a mass of 160 g . What is its density?



- (A) 2.0 g/cm^3 (B) 4.0 g/cm^3 (C) 8.0 g/cm^3 (D) 16.0 g/cm^3

2 • MOTION, VELOCITY AND ACCELERATION

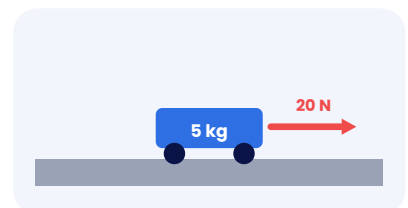
A car increases its velocity from 6 m/s to 18 m/s in 4 seconds. What is its average acceleration?



- (A) 2 m/s^2 (B) 3 m/s^2 (C) 4.5 m/s^2 (D) 6 m/s^2

3 • FORCES AND NEWTON'S LAWS

A 5 kg trolley experiences a resultant force of 20 N on a horizontal surface. What is its acceleration?



- (A) 0.25 m/s^2 (B) 2 m/s^2 (C) 4 m/s^2 (D) 100 m/s^2

4 • PRESSURE, DENSITY AND BUOYANCY

A box exerts a force of 600 N on the floor over an area of 0.20 m^2 . What pressure does it exert?

- (A) 120 Pa (B) 300 Pa (C) $1,200\text{ Pa}$ (D) $3,000\text{ Pa}$

5 • WORK, ENERGY AND POWER

A machine transfers 900 J of energy in 15 seconds. What is its power output?

- (A) 60 W (B) 75 W (C) 135 W (D) $13,500\text{ W}$

6 • HEAT AND THERMAL ENERGY

Equal masses of water and copper receive the same amount of thermal energy. Copper has a lower specific heat capacity than water. Assuming no energy is lost, which substance experiences the greater temperature rise?

(A) Water, because it stores more energy per degree

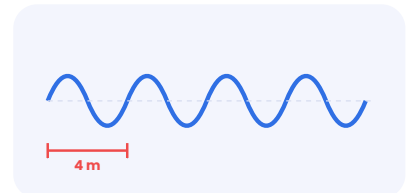
(B) Both have the same temperature rise

(C) Copper, because less energy is needed per degree of temperature rise

(D) Neither changes temperature

7 • WAVES AND SOUND

A wave has a frequency of 50 Hz and a wavelength of 4 m. What is its speed?



(A) 12.5 m/s

(B) 46 m/s

(C) 100 m/s

(D) 200 m/s

8 • LIGHT, REFLECTION AND REFRACTION

A ray travels from air into glass and bends towards the normal. Which statement best explains this?

(A) The light speeds up in glass.

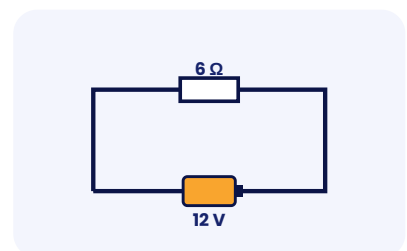
(B) The light slows down as it enters glass.

(C) The frequency of light must double.

(D) The light stops travelling through glass.

9 • ELECTRICITY AND OHM'S LAW

A resistor of $6\ \Omega$ is connected across a 12 V battery. What current flows through it?



(A) 0.5 A

(B) 2 A

(C) 6 A

(D) 72 A

10 • MAGNETISM AND ELECTROMAGNETISM

An electromagnet is connected to a battery. Which change will generally increase its strength if the core and other conditions remain the same?

- (A) Reducing the number of coil turns
- (B) Removing the iron core
- (C) Increasing the number of turns in the coil
- (D) Disconnecting the battery

11 • ATOMIC STRUCTURE AND THE PERIODIC TABLE

An atom has 17 protons, 18 neutrons and 17 electrons. What are its atomic number and mass number?

- (A) Atomic number 17; mass number 35
- (B) Atomic number 35; mass number 17
- (C) Atomic number 18; mass number 34
- (D) Atomic number 17; mass number 18

12 • COMPOUNDS AND CHEMICAL FORMULAE

How many oxygen atoms are present in 3 formula units of $\text{Al}_2(\text{SO}_4)_3$?

- (A) 4
- (B) 6
- (C) 12
- (D) 36

13 • ACIDS, BASES, SALTS AND PH

Solution X has pH 2 and solution Y has pH 5. Which statement is correct?

- (A) Y is more acidic than X.
- (B) X is more acidic than Y.
- (C) Both are neutral.
- (D) X is alkaline.

14 • SOLUTIONS AND SEPARATION TECHNIQUES

A student dissolves 20 g of salt in enough water to make 500 cm³ of solution. What is the concentration in g/dm³?

(A) 10 g/dm³**(B)** 20 g/dm³**(C)** 40 g/dm³**(D)** 100 g/dm³**15** • METALS, NON-METALS AND CHEMICAL CHANGES

A student places clean iron nails in copper sulfate solution. After some time, a reddish-brown coating forms on the nails. What is the best explanation?

(A) Iron is less reactive than copper.**(B)** Copper sulfate has evaporated onto the nails.**(C)** The iron has melted.**(D)** Iron displaces copper from the solution.**16** • CELLS, MICROSCOPY AND CELL DIVISION

A microscope has a 10× eyepiece lens and a 40× objective lens. What is the total magnification?

**(A)** 50×**(B)** 400×**(C)** 4×**(D)** 4,000×**17** • PHOTOSYNTHESIS AND RESPIRATION

A green plant is kept in bright light, but the carbon dioxide concentration around it is extremely low. Which process is most directly limited?

(A) Water absorption by the roots only**(B)** Mineral uptake by root hairs only**(C)** Photosynthesis and glucose production**(D)** The movement of water through xylem only

18 • HUMAN PHYSIOLOGY AND NUTRITION

A person eats a meal containing starch, protein and fat. Where does most absorption of the digested nutrients into the blood or lymph occur?

(A) Small intestine

(B) Oesophagus

(C) Stomach

(D) Large intestine

19 • GENETICS AND HEREDITY

In a simplified genetic model, allele T for tallness is dominant over allele t for shortness. Two Tt plants are crossed. What is the probability of an offspring being tt?

(A) 0%

(B) 25%

(C) 50%

(D) 75%

20 • MICROORGANISMS, DISEASE AND IMMUNITY

Why do antibiotics generally not cure influenza?

(A) Influenza is caused by a fungus.

(B) Antibiotics work only at high temperatures.

(C) Influenza is caused by a virus, and antibiotics target bacteria.

(D) Viruses contain no genetic material.

21 • ECOLOGY AND BIODIVERSITY

In a food chain, grass → rabbit → fox, only about 10% of the energy at one trophic level is transferred to the next. If grass stores 20,000 kJ, approximately how much energy reaches the fox?

(A) 20 kJ

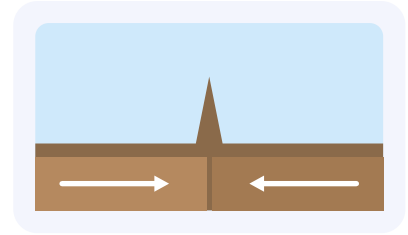
(B) 200 kJ

(C) 2,000 kJ

(D) 18,000 kJ

22 • EARTH STRUCTURE AND PLATE TECTONICS

Two tectonic plates move towards one another. Which geological event is commonly associated with this boundary?



- ☐ (A) The formation of new ocean crust at a spreading ridge only
- ☐ (B) No geological activity
- ☐ (C) The permanent disappearance of gravity
- ☐ (D) Mountain building or subduction, depending on the plates

23 • ATMOSPHERE, WEATHER AND CLIMATE

Warm, moist air rises and cools to its dew point. What is most likely to happen next?

- ☐ (A) Water vapour condenses into tiny droplets, potentially forming clouds.
- ☐ (B) All water vapour becomes oxygen.
- ☐ (C) The air must become hotter as it rises.
- ☐ (D) The atmospheric pressure becomes zero.

24 • SOLAR SYSTEM AND THE UNIVERSE

A planet is 4 times farther from its star than Earth is from the Sun. Using the inverse-square law, what fraction of the energy received per unit area would it receive if the star had the Sun's luminosity?

- ☐ (A) $1/2$
- ☐ (B) $1/4$
- ☐ (C) $1/8$
- ☐ (D) $1/16$

25 • SCIENTIFIC INVESTIGATION AND DATA ANALYSIS

A student tests whether light intensity affects plant growth. Which approach provides the strongest evidence?

(A) Change light intensity and water supply together.

(B) Use similar plants, vary light intensity, control other variables, and measure growth repeatedly.

(C) Use one plant and measure its height once.

(D) Choose only the results that support the prediction.

26 • MOTION AND GRAPH INTERPRETATION

A runner travels 100 m east in 20 s and then 100 m west in 20 s, returning to the starting point. What are the runner's average speed and average velocity over the whole journey?

(A) 0 m/s and 5 m/s east

(B) 5 m/s and 5 m/s west

(C) 5 m/s and 0 m/s

(D) 10 m/s and 0 m/s

27 • CHEMICAL REACTIONS AND CONSERVATION OF MASS

In a sealed container, 12 g of carbon reacts completely with 32 g of oxygen to form carbon dioxide. What mass of carbon dioxide is produced?

(A) 20 g

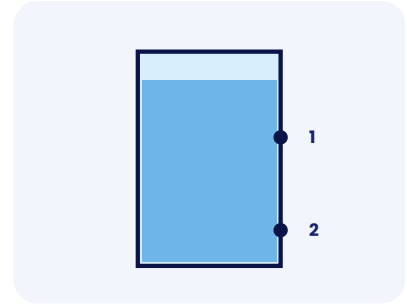
(B) 32 g

(C) 40 g

(D) 44 g

28 • PRESSURE IN LIQUIDS

Two identical holes are made at different depths in the side of a water tank. Which hole generally sends water out with greater pressure?



- ☐ (A) The lower hole, because liquid pressure increases with depth
- ☐ (B) The upper hole, because gravity is weaker there
- ☐ (C) Both have zero pressure
- ☐ (D) The upper hole, because it contains less water above it

29 • WORK AND SIMPLE MACHINES

A student uses a machine to lift a 300 N load by 2 m. The student applies an effort of 100 N over 8 m. What is the machine's efficiency?

- ☐ (A) 25%
- ☐ (B) 50%
- ☐ (C) 75%
- ☐ (D) 100%

30 • SCIENTIFIC REASONING AND EXPERIMENTAL ERRORS

A student repeats an experiment five times and obtains 12.1, 12.2, 12.1, 12.3 and 15.8 cm. The last result is much higher than the others. What is the best scientific response?

- ☐ (A) Delete the last result without explanation.
- ☐ (B) Change all the other results to 15.8 cm.
- ☐ (C) Check for a possible error, repeat the measurement and report the data transparently.