



Candidate Name	
School Name	

## GENERAL SCIENCES

**Saturday 27 February 2016**

**1 hour 30 minutes**

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### INSTRUCTIONS TO CANDIDATES

- Do not open this examination paper until instructed to do so.
- You are not permitted access to any calculator for this paper.
- Section A: choose the answer you consider to be the best and indicate your choice on the answer sheet provided.
- Section B: answer all questions in the boxes provided. Unless otherwise stated in the question, all numerical numbers should be given exactly or correct to three significant figures.
- The maximum mark for this examination paper is [70 marks].

## SECTION A

Answer **all** questions in the answer sheet provided. (Total: 40 marks)

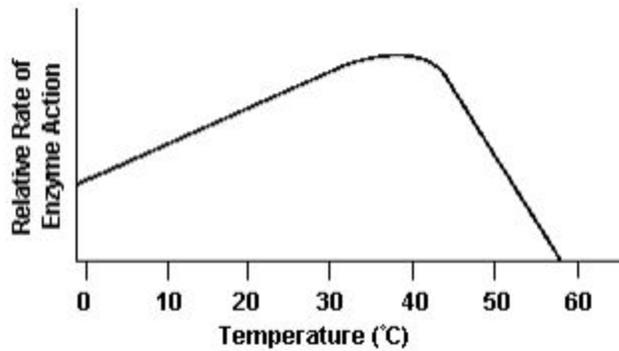
1. When a gas is turned into a liquid, the process is called
  - a. condensation
  - b. sublimation
  - c. evaporation
  - d. deposition
  
2. Which of the following parts of the sun is easily visible only during a total solar eclipse?
  - a. core
  - b. photosphere
  - c. sunspots
  - d. corona
  
3. The accumulation of stress along the boundaries of lithospheric plates results in which of the following?
  - a. earthquakes
  - b. magnetic reversals
  - c. hurricanes
  - d. increased deposition of deep-sea sediments
  
4. As you go down into a well, your weight
  - a. increases
  - b. decreases
  - c. remains the same
  - d. none of the above

5. Which prefix is often used with scientific terms to indicate that something is the same, equal or constant?
- iso
  - mega
  - meta
  - quasi
6. Which of the following best describes the term static?
- low
  - constant
  - stationary
  - steady
7. In which of the following organelles of a plant cell does photosynthesis occur?
- Mitochondria
  - Ribosome
  - Chloroplast
  - Cell wall

8. Which of the following is incorrect?

	Element	Neutrons	Protons	Electrons
a.	Lithium	4	3	3
b.	Hydrogen	0	1	1
c.	Carbon	6	6	6
d.	Nitrogen	8	7	7

9. The effect of temperature on the relative rate of action of an enzyme is represented in the graph.



The optimum temperature for the action of of this enzyme is approximately

- a. 15 °C
  - b. 22 °C
  - c. 37 °C
  - d. 50 °C
10. Which of the following substances cannot be broken down into simpler substances using chemical means?
- a. Element
  - b. Atoms
  - c. Compound
  - d. Mixture
11. Which of the following is a not a member of the alkali metals?
- a. Francium
  - b. Potassium
  - c. Sodium
  - d. Strontium

12. Which is the balanced equation of the haber process?

- a.  $2N + 2H_2 \leftrightarrow 2NH_2$
- b.  $N_2 + 3H_2 \leftrightarrow 2NH_3$
- c.  $N_2 + 6H \leftrightarrow 2NH_3$
- d.  $N + H_2 \leftrightarrow NH_2$

13. Which element is the most malleable?

- a. Bromine
- b. Carbon
- c. Gold
- d. Sulfur

14. Newton's Third Law of Motion states:

- a. For every action there is an equal and opposite reaction
- b. Law of Inertia
- c. Conservation of Mass
- d.  $F=ma$

15. What is the product of the reaction between acid and base?

- a.  $H_2$
- b. salt
- c.  $O_2$
- d. strong acid

16. Where does the substrate bind to the enzyme?

- a. reception site
- b. receiving site
- c. active site
- d. activation site

17. What day is it when the sun is in the farthest south and the length of time between Sunrise and Sunset is the shortest of the year?
- Summer Solstice
  - Winter Solstice
  - Spring Equinox
  - Autumn Equinox
18. A prediction was made that the optimum temperature of human catalase is 37 degrees C. This prediction is called a
- law
  - theory
  - hypothesis
  - conclusion
19. In humans, the alleles for A and B are codominant to the allele for O. In a cross between AB and AO, what percentage of the offspring have the blood type A?
- 100%
  - 25%
  - 50%
  - 75%
20. Which of the following levels of organization best represents the sequence from largest to smallest unit?
- cell, tissue, organ, organ system
  - organ system, tissue, organ, cell
  - organ, organ system, cell, tissue
  - organ system, organ, tissue, cell

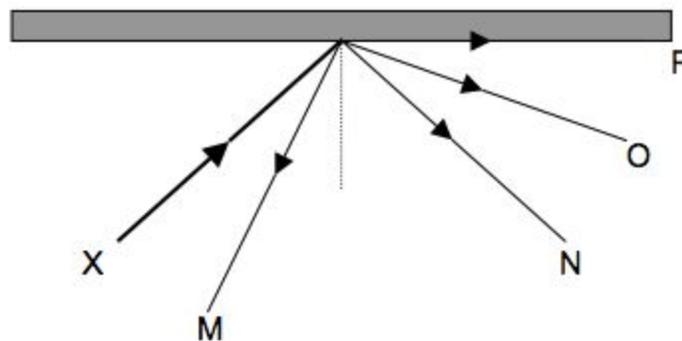
21. Which of the following is not a salt?

- a. Sodium hydroxide
- b. Sodium chloride
- c. Potassium chloride
- d. Calcium carbonate

22. What is the acceleration of a car that starts from rest and accelerates uniformly over a time of 5.21 seconds for a distance of 110 m?

- a.  $8.10 \text{ m/s}^2$
- b.  $8.10 \text{ m/s}$
- c.  $8.00 \text{ m/s}^2$
- d.  $0 \text{ m/s}^2$

23. The diagram shows the path of a light ray , X, directed at a plane mirror



The correct reflected ray is

- a. M
- b. N
- c. O
- d. P

24. Plants get their majority of their nitrogen from

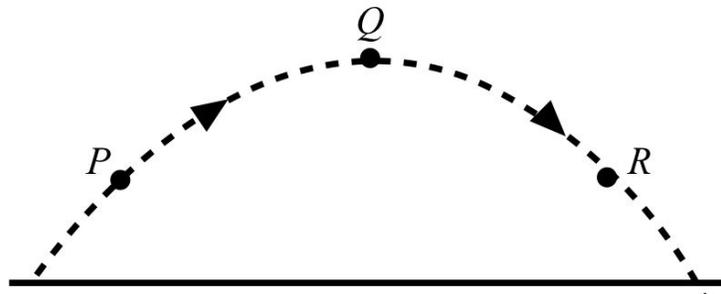
- a. rain
- b. soil
- c. air
- d. bedrock

25. Steel is made up of the following two elements:

- a. iron and carbon
- b. carbon and aluminium
- c. nickel and silicon
- d. aluminium and nickel

26. A ball is thrown and follows the parabolic path shown above. Air friction is negligible.

Point  $Q$  is the highest point on the path. Points  $P$  and  $R$  are the same height above the ground.



How do the speeds of the ball at the three points compare?

- a.  $V_P < V_Q < V_R$
- b.  $V_P = V_R < V_Q$
- c.  $V_Q < V_R < V_P$
- d.  $V_Q < V_P = V_R$

27. People with which blood group are called universal donors?

- a. AB
- b. A
- c. B
- d. O

28. Which acid is produced when milk gets sour?

- a. Tartaric acid
- b. Butyric acid
- c. Lactic acid
- d. Acetic acid

29. Which of the following is a water-borne diseases?

- a. Viral hepatitis B
- b. Cholera
- c. Dengue
- d. Influenza

30. Water boils at a lower temperature on the mountains because

- a. It is cold on the mountains
- b. There is less carbon dioxide on the mountains
- c. There is a decrease in air pressure on the mountains
- d. there is less oxygen

31. The most abundant organic molecule on the surface of the Earth is

- a. cellulose
- b. chitin
- c. DNA
- d. hemoglobin

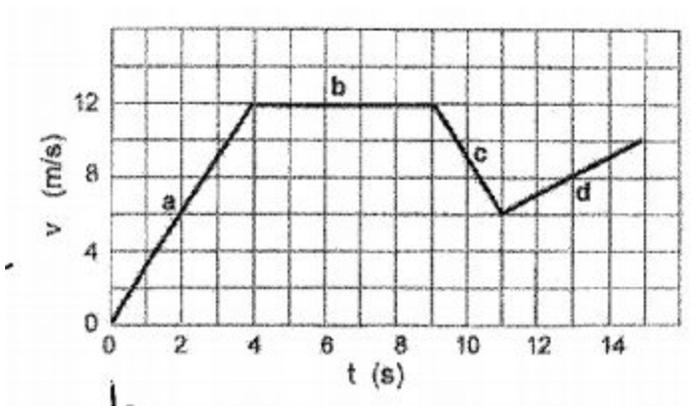
32. Consider the following:

- I. Photosynthesis
- II. Respiration
- III. Decay of organic matter
- IV. Volcanic action

Which of the above add carbon dioxide to the carbon cycle on Earth?

- a. II, III, and IV only
- b. I and IV only
- c. II and III only
- d. I, II, III, and IV

Questions 33-36 refer to the velocity-time graph of car's motion



33. In which section is the car accelerating from rest?

- a. A
- b. B
- c. C
- d. D

34. In which section is the car's acceleration negative?

- a. A
- b. B
- c. C
- d. D

35. When is the car at constant velocity?

- a. A
- b. B
- c. C
- d. D

36. What did the car do between C and D?

- a. Change directions
- b. Increased speed
- c. Decreased speed
- d. Took a rest

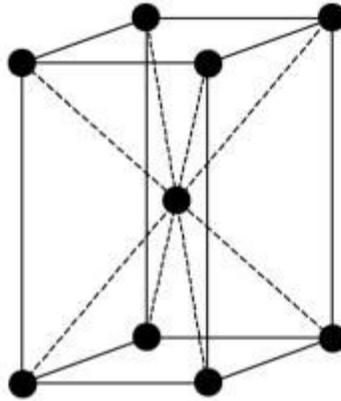
37. The intensity of earthquakes is measured on

- a. Richter scale
- b. Secant scale
- c. Mercalli scale
- d. Beaufort scale

38. Saltwater freezes at

- a. the same temperature as fresh water.
- b. at a slightly higher temperature than fresh water
- c. at a slightly lower temperature than fresh water.
- d. saltwater does not freeze.

39. The diagram below shows



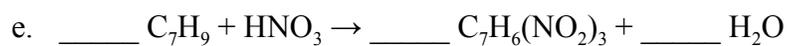
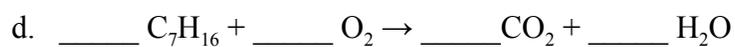
- a. a rhombic crystal
  - b. a face-centered crystal
  - c. a body-centered crystal
  - d. a crystal with 6:6 coordination
40. Water flows through a horizontal pipe at a constant volumetric rate. At a location where the cross sectional area decreases, the velocity of the fluid
- a. increases
  - b. decreases
  - c. stays the same
  - d. none of the above

## SECTION B

Answer **all** questions in the boxes provided. (Total: 30 marks)

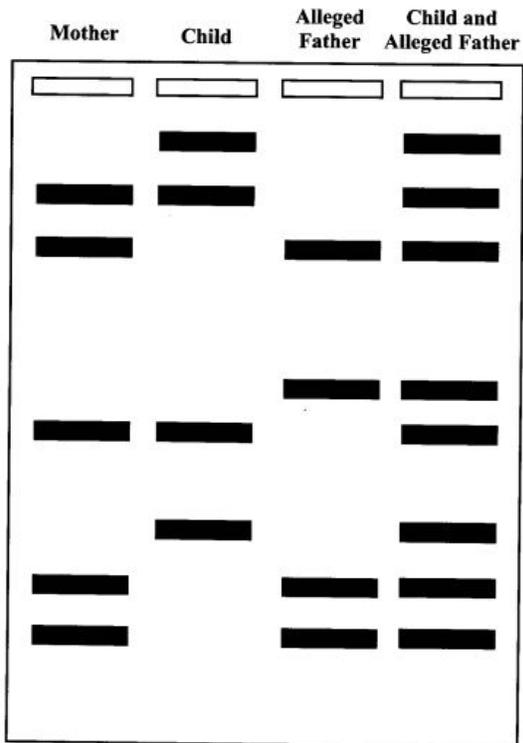
1. [Maximum mark: 5]

Balance the following equations:



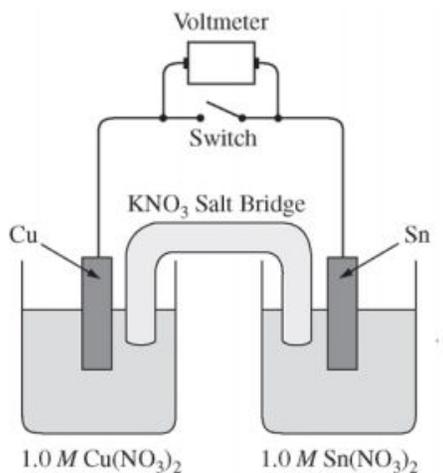
2. [Maximum mark: 2]

Below is an illustration of an autoradiogram, which is typically used in paternity disputes. Based on your knowledge of DNA fingerprinting and the fact that half a person's genome comes from each parent, is the alleged father actually the biological father of the child? Explain your answer.



3. [Maximum mark: 3]

A student is given a standard galvanic cell, represented above, that has a Cu electrode and a Sn electrode. As current flows through the cell, the student determines that the Cu electrode increases in mass and the Sn electrode decreases in mass.



- a. Identify the electrode at which oxidation is occurring. Explain your reasoning based on the student's observations. [2]

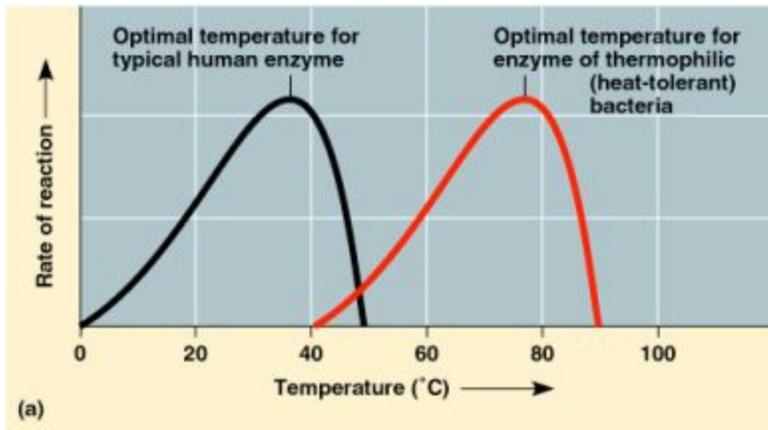
- b. As the mass of the Sn electrode decreases, where does the mass go? [1]

4. [Maximum mark: 7]

Using the diagrams below, explain how each enzyme is affected by changes in pH and temperature.

a. Explain how each enzyme is affected by changes in temperature.

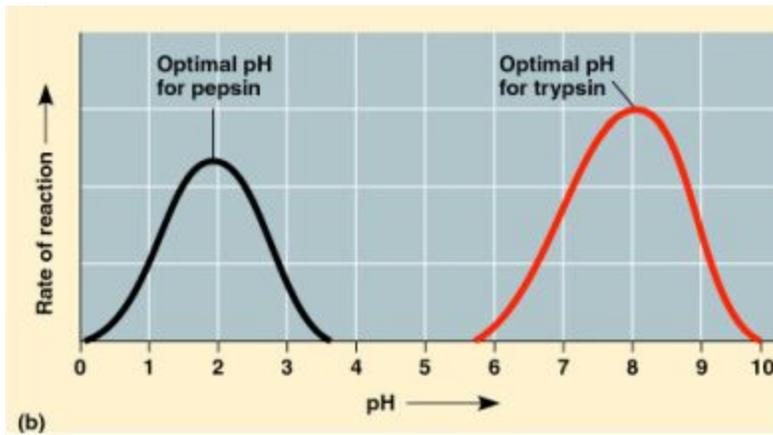
[4]



Blank area for student response.

b. Explain how each enzyme is affected by changes in pH.

[3]



Blank area for the student's answer.

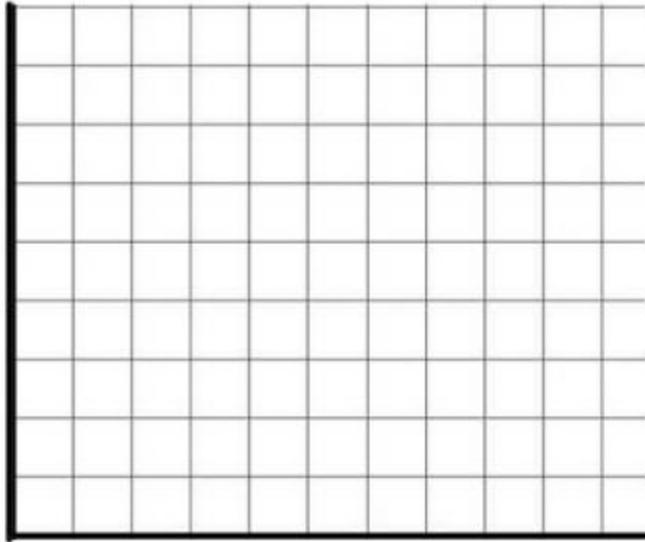
5. [Maximum mark: 6]

An engineer is designing the runway for an airport. Of the planes that will use the airport, the lowest acceleration rate is likely to be  $3 \text{ m/s}^2$ . The takeoff speed for this plane will be  $65 \text{ m/s}$ . Assuming this minimum acceleration, what is the minimum allowed length for the runway?  
Show all workings below.



6. [Maximum mark: 7]

- a. A helicopter left the landing pad at the top of a skyscraper and then quickly flew downwards towards the ground and maintained a 5 foot distance above the ground for a while before it had to fly up above a small hill and land at the bottom of the far side of the hill. Draw a **distance vs time** graph that depicts the journey of the helicopter . The distance represent how high the helicopter is above the ground. [5]



- b. Draw a **distance vs time** graph of a dog that is tied to a 4 metre rope and travels in 1 complete circle [2]

